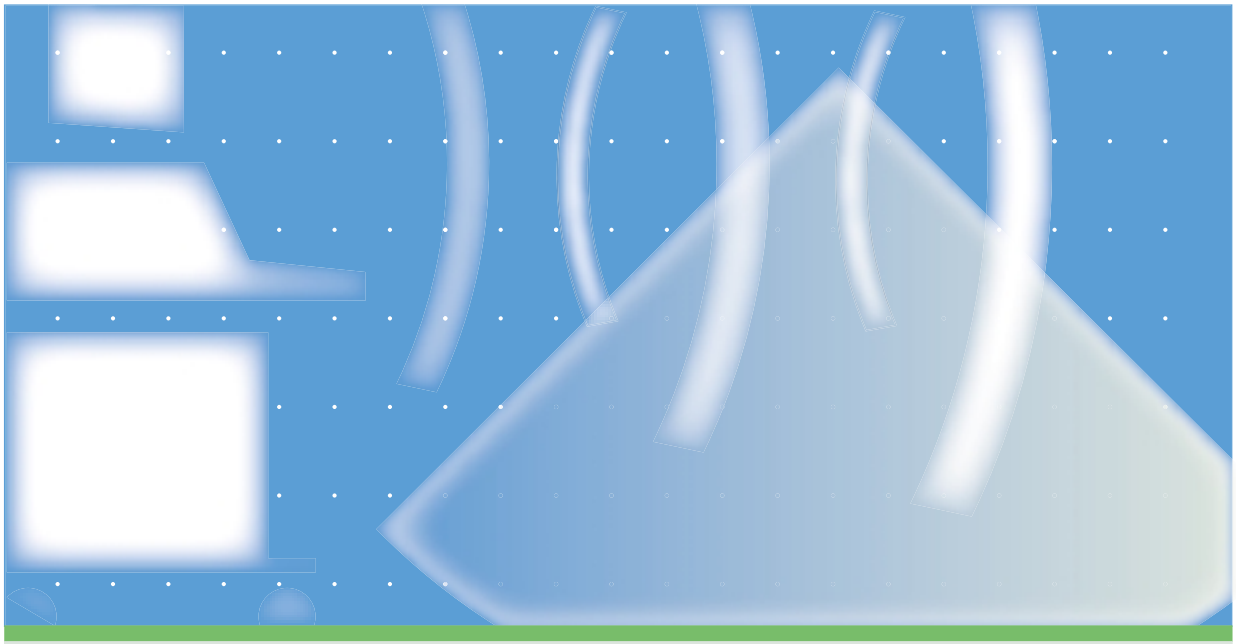

SONOS 7500/5500

System Basics

PHILIPS

User’s Guide

System Basics Guide

Philips SONOS 7500
Philips SONOS 5500

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This product may contain re-manufactured parts equivalent to new in performance or have had incidental use.

WARNING

Electrical Shock Hazard

Do not remove system covers. To avoid electrical shock, use only supplied power cords and connect only to properly grounded wall (wall/mains) outlets.

Explosion Hazard

Do not operate the system in the presence of flammable anesthetics.

Safety Information

Before you use the Philips ultrasound system, be sure to read the *Safety and Standards Guide.*

Pay special attention to the "Warnings" and "Cautions."

The warnings explain the dangers of electrical shock and explosion hazard, the safety of ultrasound, applications, guidelines for fetal use, and guidelines for setting controls that affect acoustic output and accuracy of clinical measurements.

The cautions explain potential dangers to equipment.

Warning symbol used in the Text:

WARNING

Caution symbol used in the Text:

CAUTION

Warning Symbols used on the System or its Probes:

Instruction manual symbol: The product is marked with this symbol when it is necessary for the user to refer to the user's guide.

Dangerous voltages symbol: Indicates potential for electrical shock.

Monitor Radiation

The monitor used in this system complies with the FDA regulations that were applicable at the date of manufacture (21 CFR Subcategory J).

Prescription Device

The United States Food and Drug Administration requires the following labeling statement:

Caution - Federal Law restricts this device to use by or on the order of a physician.

Important

CE 0123 marking is for Council Directive 93/42/EEC.

This system complies with the Medical Device Directive.

Authorized EU Representative:

Philips Medizin Systeme Boeblingen GmbH
Hewlett-Packard-Str. 2
71034 Boeblingen
Germany

Philips Ultrasound
3000 Minuteman Road
Andover, MA 01810-1099
(978) 687-1501
www.medical.philips.com

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Preface

This guide describes the basic operation of the Philips SONOS 7500 and SONOS 5500 ultrasound imaging systems.

What's New In This Guide For D.0

The following major additions, deletions, and changes were made to this guide for software revision D.0:

- This manual does *not* include information about Live 3D and BiPlane imaging modes. For more information about them, see the *Using 3-Dimensional and BiPlane Imaging* guide.
- Material about the SONOS 4500 system and about strip-chart recorders is removed, since these are not supported by software revision D.0.
- The book's organization is changed, to make it easier for readers to use it in conjunction with the SONOS system's *Getting Started Audio CD*.
- A new chapter is added, to summarize how to set up, perform, and record ultrasound exams. (See Chapter 6.)
- Brief introductions are added to all chapters, to provide better context and perspective, and to give readers handy pointers to each chapter's contents.
- The last chapter (about ordering supplies and accessories) is removed, and replaced by ordering information at the end of Chapter 1.

The SONOS D.0 Documentation Set

Use this guide in conjunction with the following books:

- *Controls Reference*—Provides a detailed description of all system controls.
- *Safety and Standards Guide*—Provides information on safety issues.
- *Measurements and Calculations Reference*—Provides information on measurements and calculations that you can perform on your ultrasound system.
- *Transducer Reference*—Provides information on the operation, care, and cleaning of transducers.

Additionally, several specialty guides and multimedia products describe SONOS imaging applications and optional packages:

- *Using Integrated Digital Interface (IDI)*
- *Using Stress Echocardiography*
- *Using 3-Dimensional and BiPlane Imaging*
- *Using Contrast Imaging*
- *Using Acoustic Quantification*
- *Using Acoustic Densitometry*
- *SONOS Live 3D Cardiac Echo: Features and Fundamentals* (a CD guide to Live-3D cardiac imaging)
- *LVO and Contrast CK: A Practical Approach* (a video guide to SONOS contrast echocardiography detection techniques)
- *Stress Audio CD* (a spoken guide to performing SONOS stress echocardiography studies)

Conventions Used in This Guide

The following conventions are used in this guide:

- Touch-panel and rotary control names appear in bold text. For example, **Acquire Loop**.
- Function keys appear in a box. For example, Enter.

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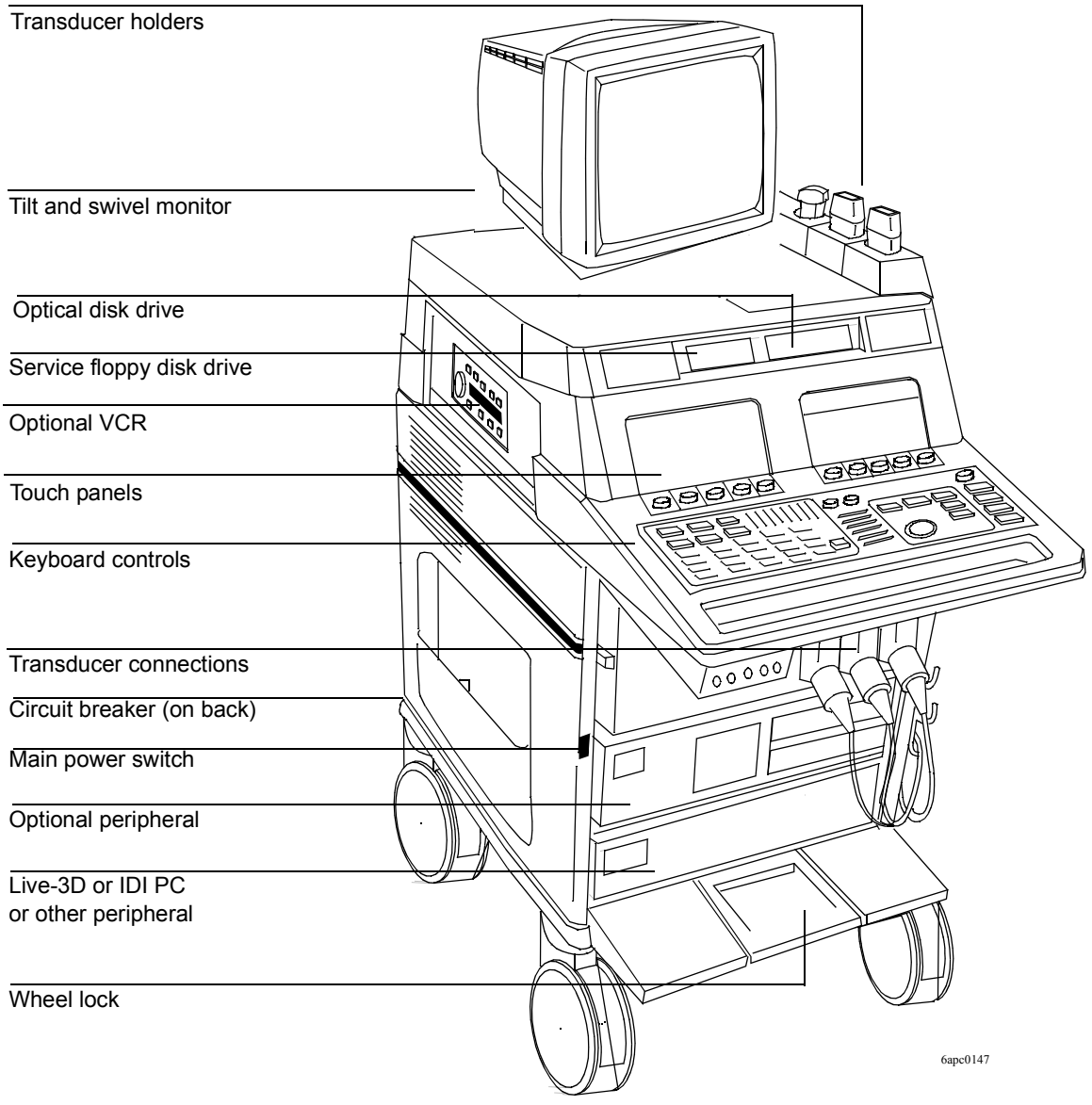
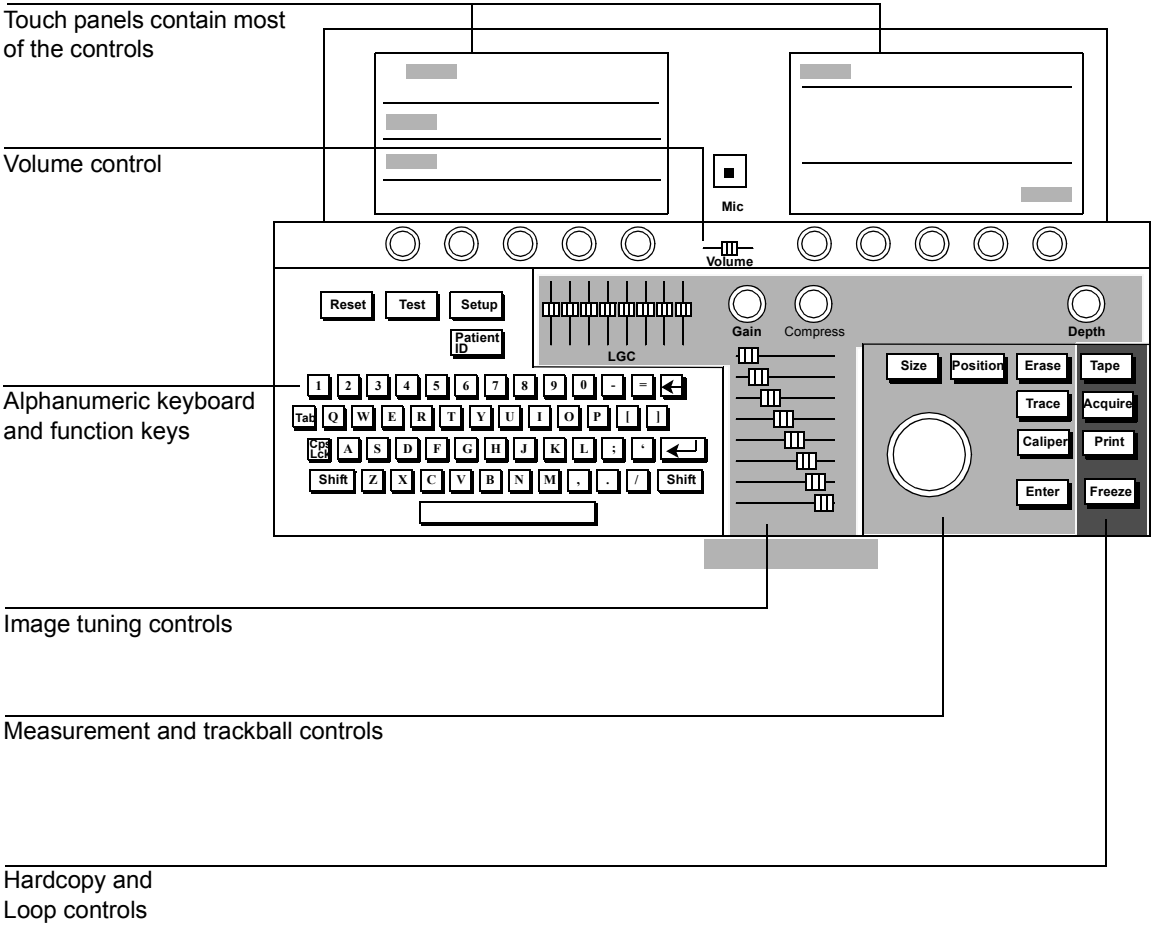
1 The System

Main Components



Control Panel



Function keys, such as **Setup**, **Position**, and **Freeze**, are active when their status lights are on. Pressing these keys turns them on or off.

Touch Panels

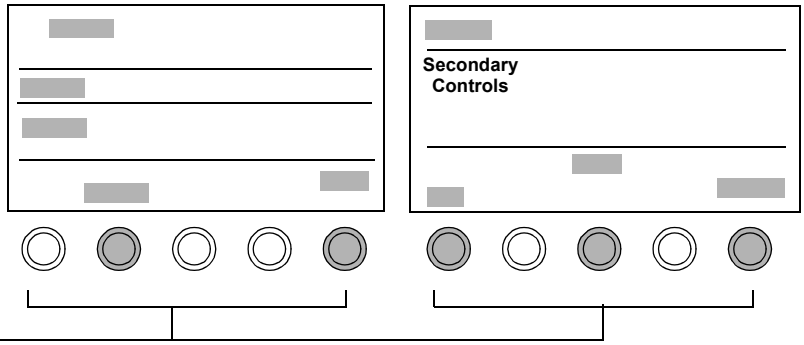
When you touch a control, the system highlights it to indicate the control is active. System controls, such as **Presets**, **Tools**, **Physio**, and **Probes** are located on the left touch panel. Imaging modalities, such as **2D**, **MMode**, **Color**, **PW**, **CW**, and **Angio** appear on the primary right touch panel. Additional touch and rotary controls pertaining to the selected modality also appear on the primary right touch panel. In some cases, you will see **Secondary Controls** on the right touch panel. Touching this control displays another touch panel that contains controls that are not used as frequently.

Depending on the system you have and on your system's options, you might not see some of the controls shown in this guide. Also, the illustrations in this book show only the pertinent controls required to access a function.

To turn off an active (highlighted) control, touch it.

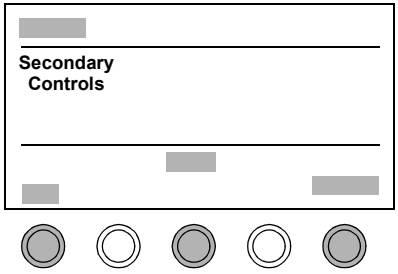
Left Touch Panel
Contains system-specific controls.

Right Touch Panel
Contains mode-specific controls.



Each rotary control adjusts the highlighted control above it. To change the value displayed, turn the rotary control to the right or left.

Secondary Touch Panel
Contains less frequently used controls.



System Power

All systems have a separate circuit-breaker switch on the back panel, near the power-cord connection. This switch has on and off settings. If the SONOS system does not power up when the main power switch is turned on, this circuit-breaker may have tripped or may be set to off. If this happens, turn the circuit breaker completely off and then back on. Then turn system power on using the main power switch.

Systems without PCs

The main power switch immediately turns the system on and off .

NOTE When the system is turned off, standby power remains on.

Systems with PCs

NOTE Systems with PCs are equipped with circuitry to properly shut down the PC. Following the procedure described below helps to increase the reliability of the system.

- Turning the main power switch on turns on both the SONOS system and the PC.
- Turning the main power switch off and leaving it off for approximately three seconds starts the controlled PC-shutdown procedure:

1 An onscreen message displays:
Please wait while the system shuts down.

2 The SONOS system then begins to shut down. It disables all controls and suspends scanning and other processing.

NOTE Turning the main power switch back on before the shutdown message is displayed stops the shutdown procedure. The system and PC remain on.

NOTE After the shutdown message has displayed, the system ignores further changes to the main power-switch setting, and shutdown completes. However, if you change the power-switch setting after the shutdown message is displayed, the new setting takes over after shutdown. For example, if you turn the main power switch back on during the final stages of shutdown, both the system and PC power up after shutdown completes.

3 After a short delay (typically less than 30 seconds), the PC shuts down.

4 A few seconds later, the SONOS system completes shutdown, but standby power remains on.

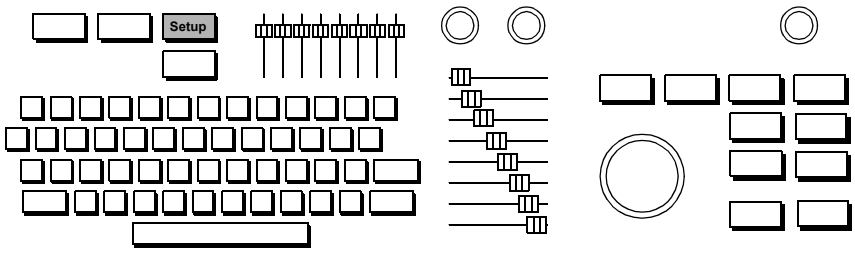
CAUTION If you disconnect the power cord before system shutdown completes, the PC may not shut down properly.

If you turn system power off before the PC boots up completely, the PC may not shut down properly.

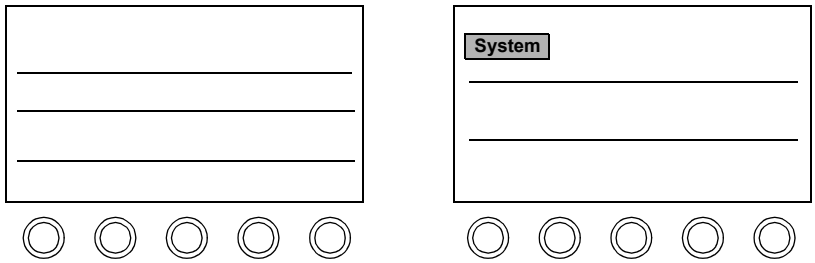
NOTE If the PC does not power up when the SONOS system powers up, turn the main power switch off, wait for the system to power down completely, and then power the system back up. If the PC still does not power up, turn the PC power on by pressing the power button on the upper-left front corner of the PC.

Setting Up the System

1. Press **Setup**.



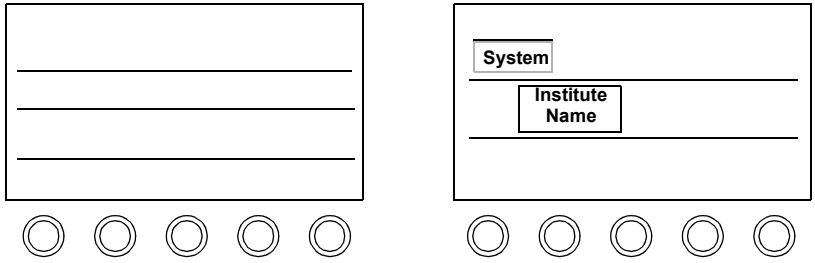
2. Touch **System**.



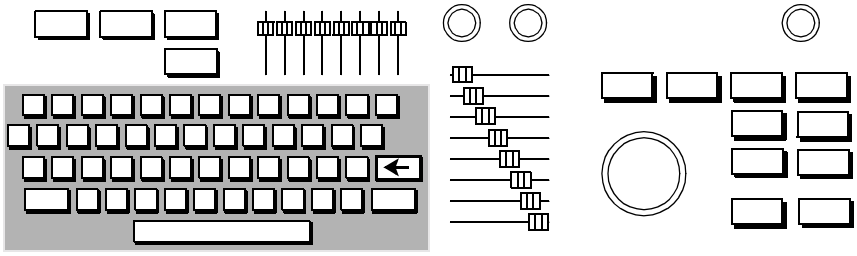
3. Perform Setup tasks described in the following sections.

Entering Your Institution Name

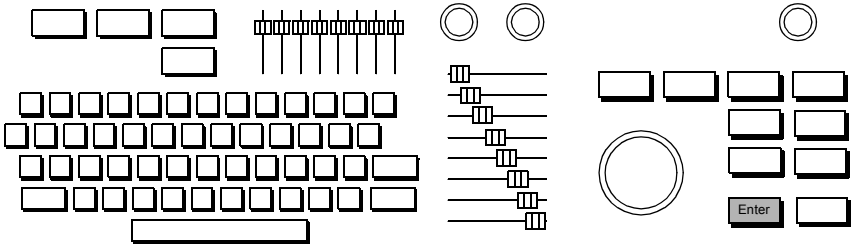
1. Touch **Institute Name**.



2. Type the name of your institution. You can type up to 32 characters on two lines. If you make a mistake, use ← to erase the previous characters.

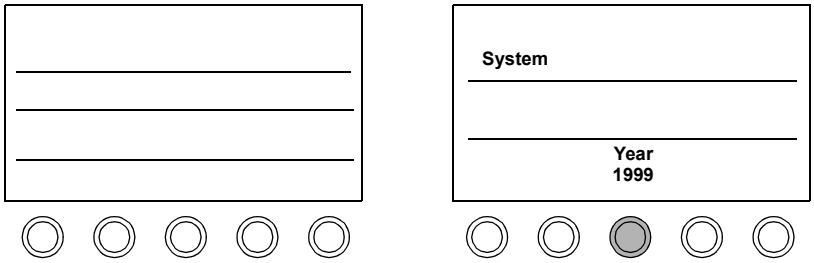


3. When you are done, press Enter twice quickly, or with the trackball, highlight **Okay** and press Enter .

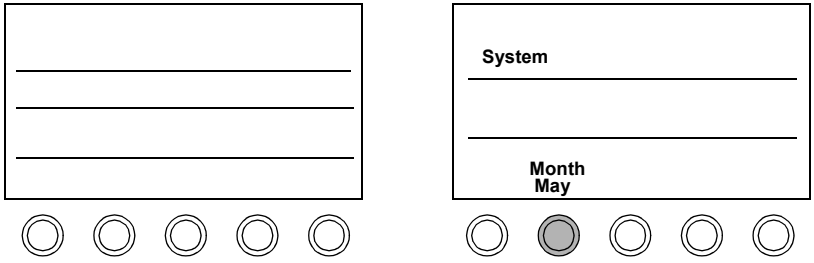


Setting the Date

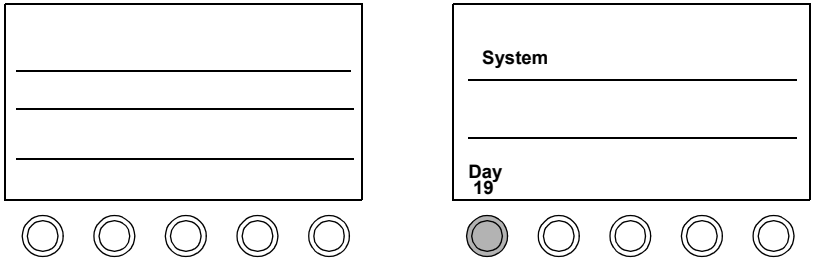
1. Turn the **Year** rotary control to the right to increase the year setting, or to the left to decrease it.



2. Turn the **Month** rotary control to the right to select a month later in the year, or to the left to select an earlier month.

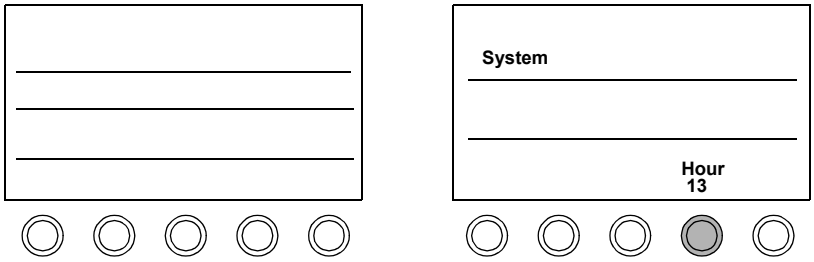


3. Turn the **Day** rotary control to the right to increase the day of the month, or to the left to decrease it.

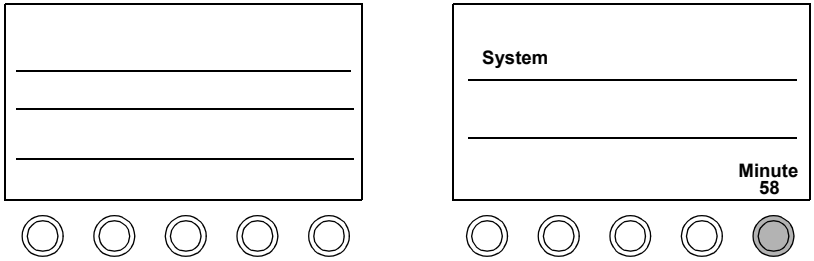


Setting the Time

1. Turn the **Hour** rotary control to the right to increase the hour setting, or to the left to decrease it. The system uses a 24-hour format.



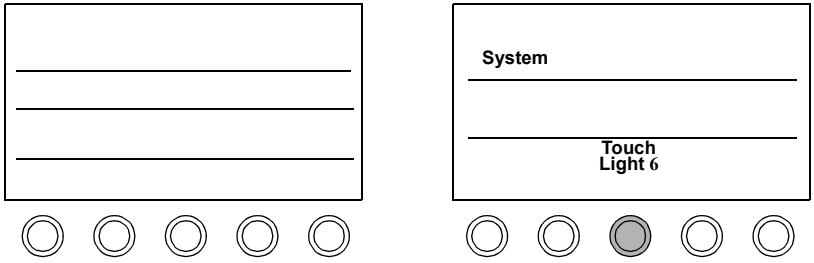
2. Turn the **Minute** rotary control to the right to increase the minutes setting, or to the left to decrease it.



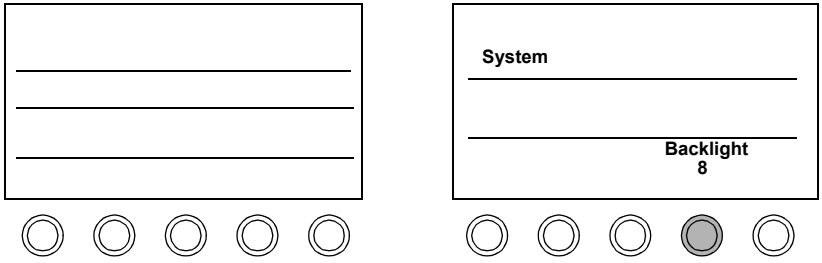
Adjusting the Control Panel and Touch Panel Lighting

Tip: Keep the **Touch Light** setting as low as possible for the ambient light.

1. To adjust the lighting of the touch controls, touch the **Touch Light** control and turn the **Touch Light** rotary control to the right to brighten the touch controls, or to the left to dim them.



2. To adjust the lighting of the hard controls, keyboard, and sliders, touch **Backlight** and turn the **Backlight** rotary control to the right to brighten it, or to the left to dim it.



NOTE To retain system settings, save them to a preset. See "Creating Presets" on page 3-6.

Adjusting the Monitor Position

You can move the monitor up and down to find the position that is most comfortable for you.

CAUTION Do not push the release bar under the center front of the monitor unless you want to take the monitor off its base. See the *Safety and Standards Guide* for information on removing the monitor and moving the system.

Calibrating the Monitor

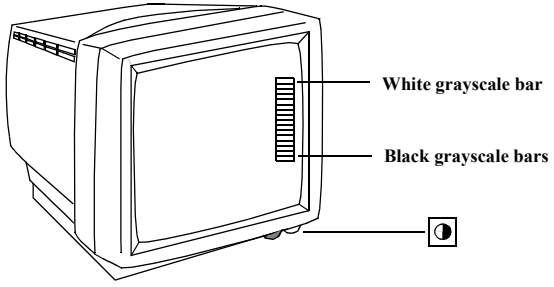
CAUTION You must calibrate the monitor lighting correctly, or improper adjustment of system controls can occur. This can result in poor real-time image quality, VCR recording quality, or print quality.

There are two versions of SONOS monitor. You calibrate one using brightness/contrast dials. You calibrate the other using brightness/contrast push buttons.

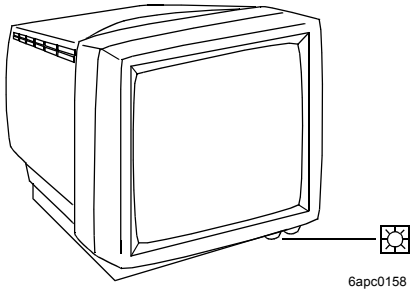
Calibrating monitors with brightness/contrast dials on the front

Tip: Adjust monitor lighting when the ambient room lighting changes, such as for bedside studies.

1. On the monitor, turn the contrast dial up just until the top grayscale bar looks pure, bright white. Once it looks pure white, do not continue to turn the contrast dial.



2. On the monitor, turn the brightness dial down just until the bottom grayscale bar (the 16th bar) looks pure black and disappears into the screen background. When the monitor is properly calibrated, 15 grayscale bars are visible, running from white (top) to nearly black (bottom).



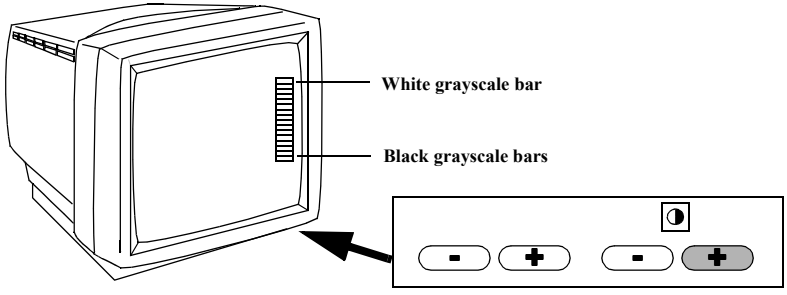
NOTE

While not a direct danger to patient or operator safety, ambient magnetic fields may affect the colors that are displayed on the imaging screen. To remove the effects of this interference, periodically degauss the monitor. Push up on the degaussing button located underneath the front-right corner of the monitor case.

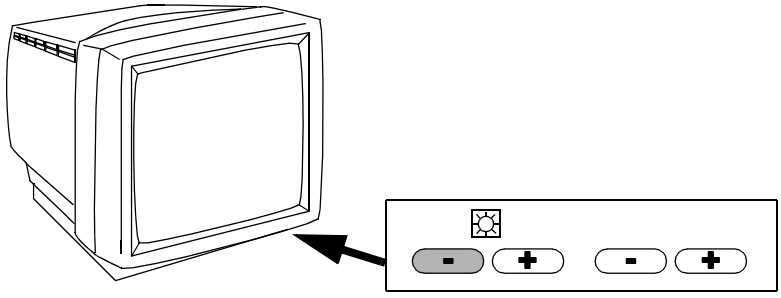
Calibrating monitors with brightness/contrast push buttons on the front

Tip: Adjust monitor lighting when the ambient room lighting changes, such as for bedside studies.

1. On the monitor, press and hold the right contrast button only until the top grayscale bar looks pure, bright white. Once it looks pure white, release the button.



2. On the monitor, press and hold the left brightness button only until the bottom grayscale bar (the 16th bar) looks pure black and disappears into the screen background. When the monitor is properly calibrated, 15 grayscale bars are visible, running from white (top) to nearly black (bottom).



NOTE

While not a direct danger to patient or operator safety, ambient magnetic fields may affect the colors that are displayed on the imaging screen. To remove the effects of this interference, periodically degauss the monitor. Press the contrast - and + buttons simultaneously. The displayed image may briefly distort, but will quickly return to normal.

Using the Foot Switch

If you are using the foot switch, plug it into the back of the system into the connector labelled Foot Switch.

Use the foot switch as follows:

- Left pedal to freeze
- Middle pedal to print
- Right pedal to tape

See *Using 3-Dimensional and BiPlane Imaging Guide* for information about using the foot switch to acquire Full Volume images in Live-3D mode.

See *Using Stress Echocardiography Guide* for information on using the foot switch during a stress exam.

See *Using Contrast Imaging* for information on using the foot switch during contrast imaging.

WARNING **Do not use the foot switch in the operating room. IEC 601-1 specifies that foot-operated control devices used in the operating room must be of watertight construction. The foot switch supplied with the ultrasound system meets only drip-proof construction requirements.**

Supplies and Accessories

To order supplies and accessories from within the U.S.A., visit:

http://shop.medical.philips.com

or call Medical Supplies at 1-800-225-0230.

From other countries, contact your local Philips representative or sales office.

2 Transducers

Introduction

This chapter provides information about

- Connecting transducers (page 2-2)
- Activating transducers (page 2-4)
- Disconnecting and storing transducers (page 2-5)
- Troubleshooting transducers (page 2-6)

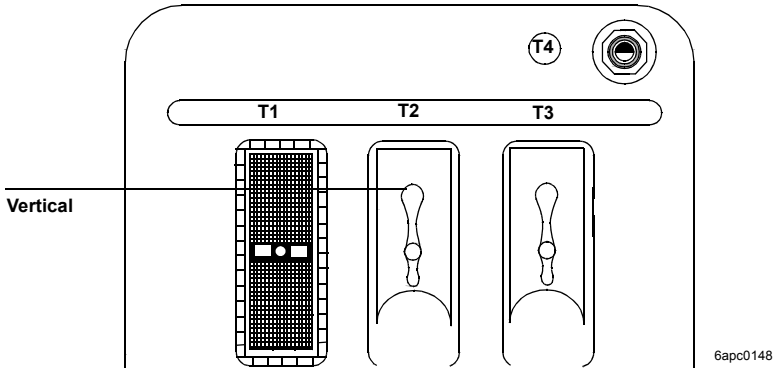
NOTE Be sure that you use only Philips-approved transducers for your ultrasound system.

See the *Transducer Reference*, *Safety and Standards Guide*, and *Using 3-Dimensional and BiPlane Imaging Guide* for specific information about Philips ImagePoint and SONOS transducer specifications, cleaning, maintenance, and applications (including the x4 transducer used for Live-3D and BiPlane imaging).

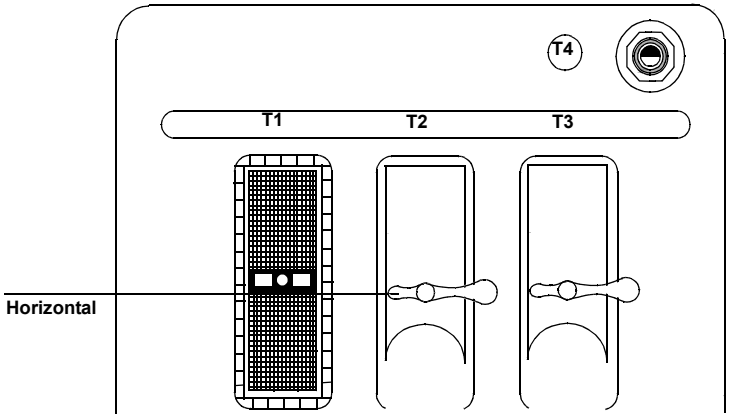
Connecting Transducers

Imaging Transducers

1. With the latch in the vertical position, insert the transducer connector. Never force a transducer into place. If you feel any resistance, check the pin positions and try reinserting it.

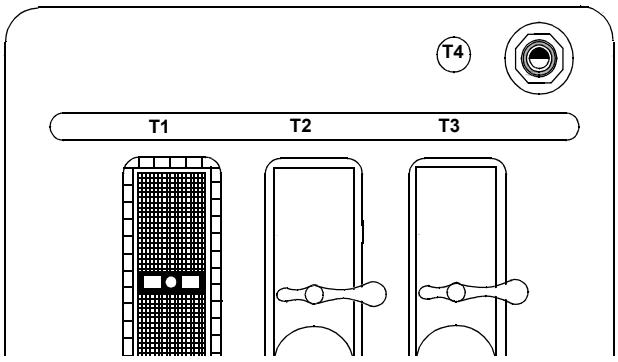


2. Lock the connector by flipping the transducer lever to horizontal.

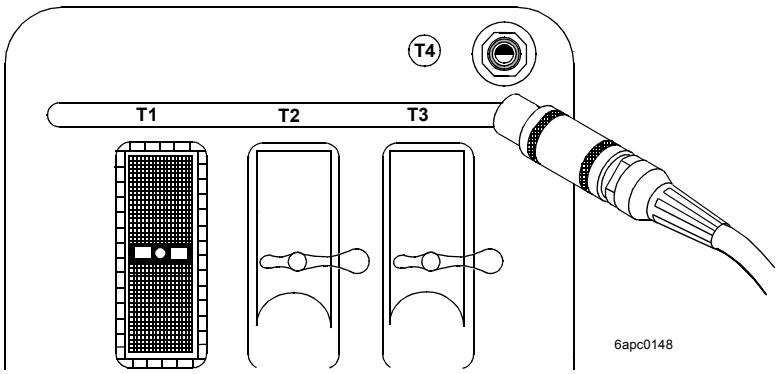


Nonimaging Doppler Pencil Transducers

1. Align the connector's prongs with the receptacle.

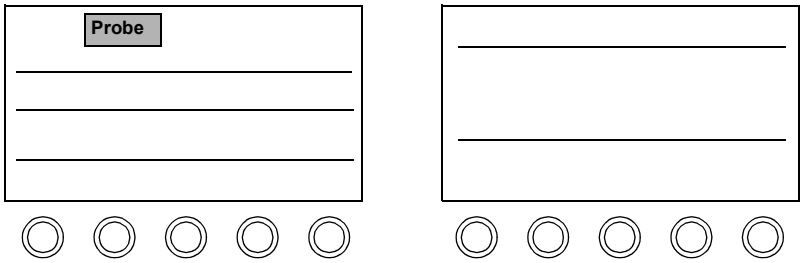


2. Insert the connector.

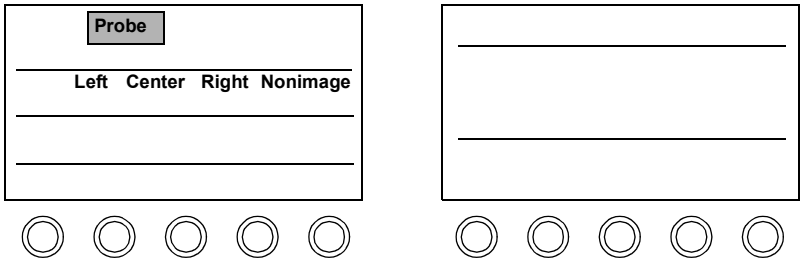


Activating Transducers

1. Touch **Probe**.

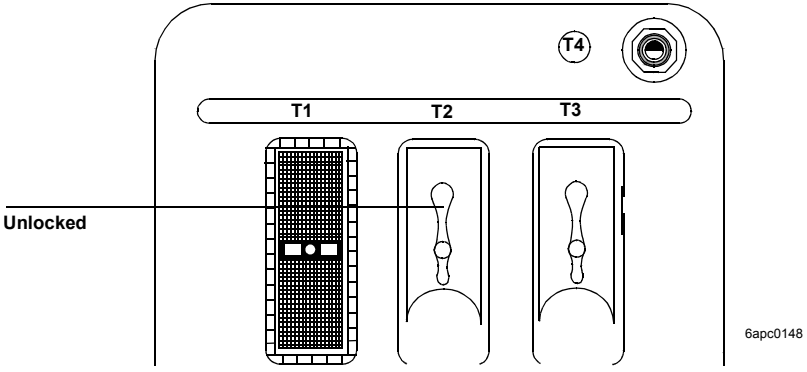


2. Touch the control indicating where the transducer is connected.

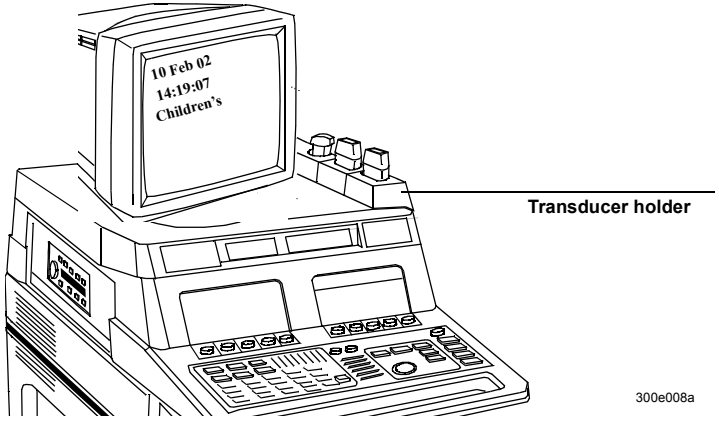


Disconnecting and Storing Transducers

1. Unlock and remove the transducer.



2. Store external imaging transducers in the holders. Place connectors in the individual side pockets to protect the pins. Store TEE transducers on a wall-mounted rack.



NOTE

See the *Transducer Reference* for information on caring for and cleaning your transducer.

Transducer Troubleshooting

Always make sure that the active preset is appropriate for the study being performed.

Symptoms	Suggestions
No Probe or **?? Probe** is displayed on the imaging screen.	Place the transducer connector lock in the horizontal position. Make sure the correct transducer slot is selected on the touch panel (**Left**, **Center**, **Right**, or **Nonimage**, under **Probe**).
No image.	Select the transducer on the touch panel (**Left**, **Center**, **Right**, or **Nonimage**, under **Probe**). Check to see if the transducer connector has any bent pins; if not, reconnect the transducer to ensure it is seated properly.
Image is too soft, hazy, or gray.	Adjust the **Postproc** rotary control to increase grayscale contrast. **Compress** to reduce low-level echoes. **Persist** to sharpen the image. Adjust monitor settings.
Image has too much contrast or is grainy.	Adjust the **Postproc** rotary control to obtain the desired image appearance. **Compress** to increase low-level echoes. Use a higher Frequency Fusion setting. Otherwise, change to a higher frequency transducer. For slow-moving structures, **Persist** to soften the image. Adjust monitor settings.

Tip: Postproc, **Edge Enhance**, and **Persist** are 2D/BMode controls. After adjusting controls, always check the transducer position.

Symptoms	Suggestions
Need better penetration.	Use the lower **Frequency Fusion** setting. Otherwise, change to a lower frequency transducer. Use the **LVO1** or **TCE1** setting if you are in Contrast Harmonic imaging, and the **Frequency Fusion 1** setting if you are in Harmonic Fusion imaging.
Linear transducer loses part of image.	Make sure gel completely covers the face of the transducer.

NOTE

If the pins on the transducer connector are bent and if the troubleshooting suggestions do not help, contact your Philips Service Representative.

3 Presets

Introduction

Tip: To remove the preset name from the screen, touch **Preset** and **Preset Name** on the left touch panel.

A preset is a group of specific control settings that optimize the system for the exam you are about to perform. You use presets to establish initial settings such as compression and gain values, color maps and processes, screen formats, and acoustic power output levels. You can also use presets to determine patient information screens, measurements, calculations, and annotation labels for the selected study.

This chapter provides information about

- Philips-defined presets (page 3-2)
- Choosing presets (page 3-3)
- Modifying presets (page 3-4)
- Creating presets (page 3-6)
- Storing presets (page 3-8)
- Copying presets to a different SONOS system (page 3-9)
- Deleting presets (page 3-10)

Philips-Defined Presets

The system ships with Philips-defined presets for each exam type. Table 3-1 shows the number of Philips-defined presets by exam type and the number of presets you can create.

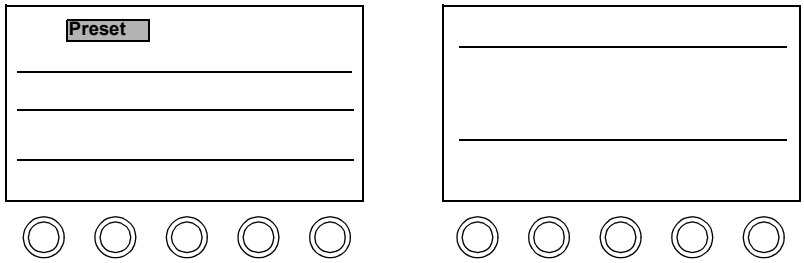
Table 3-1 Philips-Defined Presets

Exam Type	Philips-defined Presets	Available Customized Presets
Cardiac	3	9
Vascular	4	8
Abdominal	4	8
OB/GYN	4	8
Peripheral Vascular	4	8
Small Parts Exam	4	8

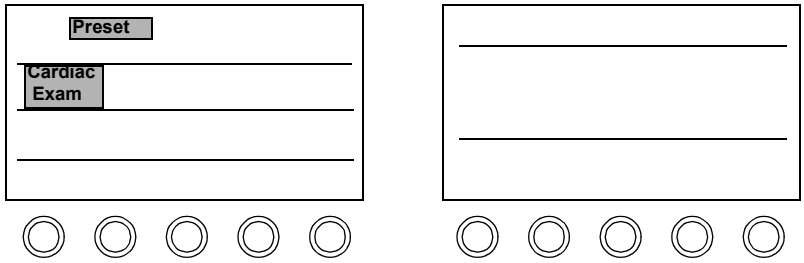
When you turn on or reset the system, it activates the last preset used. Before starting a study, check the preset shown on the screen and, if necessary, touch a more appropriate preset. Always select the Philips preset at the start of the study to return to the initial values.

Choosing Presets

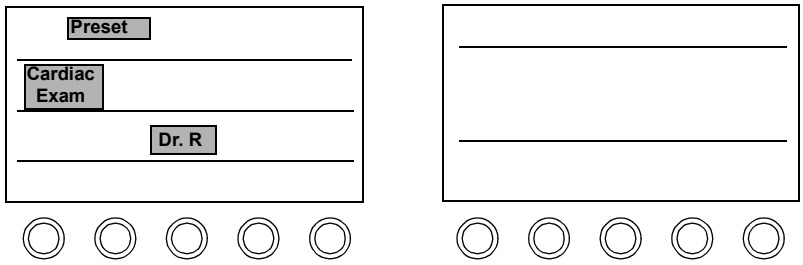
1. Touch **Preset**.



2. Touch the exam type (if applicable).



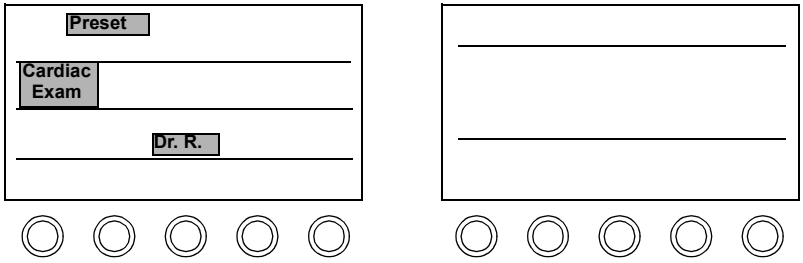
3. Touch the preset you want to use for this study.



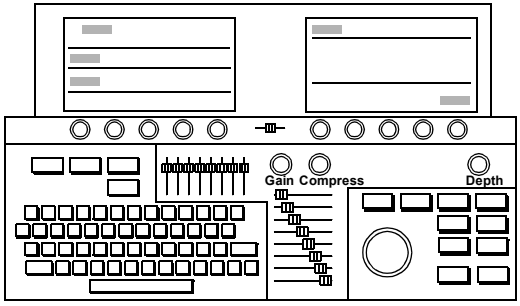
Modifying Presets

Tip: If you modify a Philips preset, you need to save it as a new preset.

1. Touch the preset you want to alter. You can modify all Philips and custom presets.

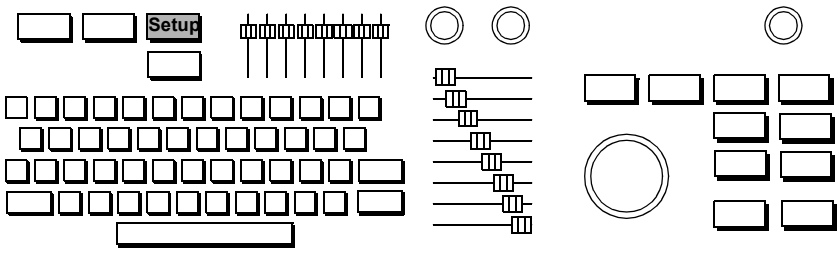


2. Adjust controls to display the image as you want to see it.

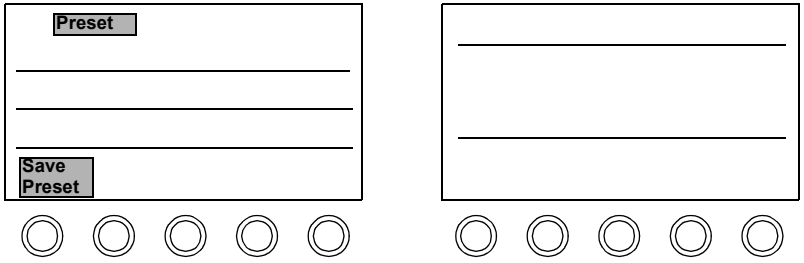


Tip: Be sure the Annotation labels and Analysis measurements and calculations are appropriate for the new preset. For more information see Chapter 8, Chapter 9, and Chapter 10.

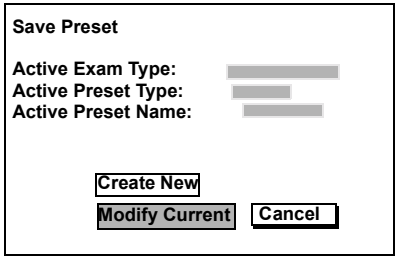
3. To change Setup values, such as lighting and display options, press **Setup** and make the necessary adjustments. Press **Setup** again to exit Setup mode.



4. With **Preset** active, touch **Save Preset.**



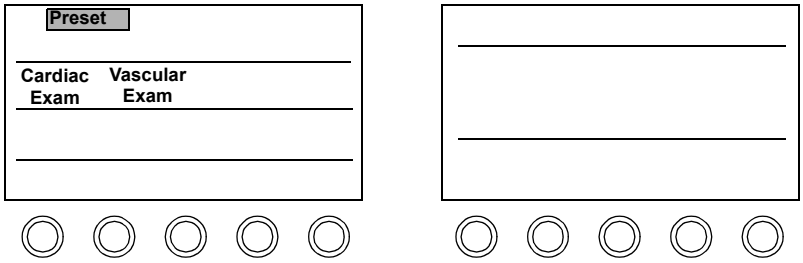
5. Select **Modify Current** with the trackball and press **Enter**. To keep the current name, quickly press **Enter** twice or highlight **Okay** and press **Enter**. To rename the preset, type a new name and quickly press **Enter** twice, or highlight **Okay** and press **Enter**.



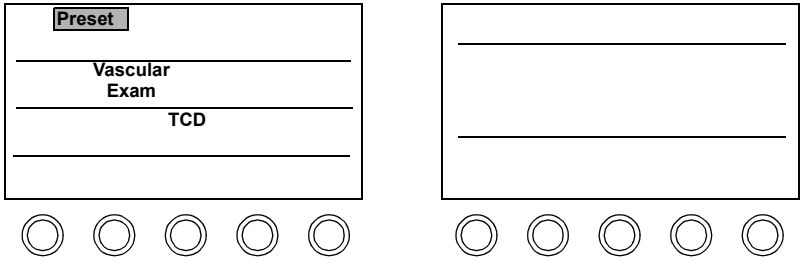
Creating Presets

You can define your own presets for each exam type and are only limited by the amount of available space on the touch panel. To create a new preset, use the following procedure:

1. Touch **Preset**.

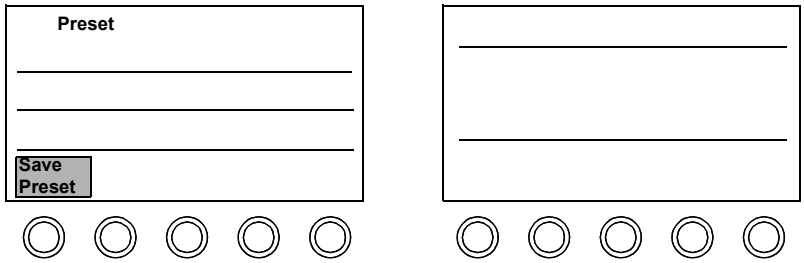


2. Touch a preset of the same exam type as the one you want to create. This ensures that most system settings, including annotation labels and analysis measurements, are appropriate for the new preset.

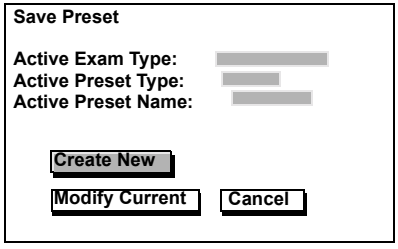


3. Adjust the controls to display the image as you want to see it. To change Setup values, such as lighting and display options, press Setup and make the necessary adjustments. Press Setup again.

4. Touch **Save Preset.**



5. Highlight **Create New** with the trackball and press Enter. You are prompted to name the new preset. Give the preset a unique name and quickly press Enter twice or select **Okay** and press Enter**.**

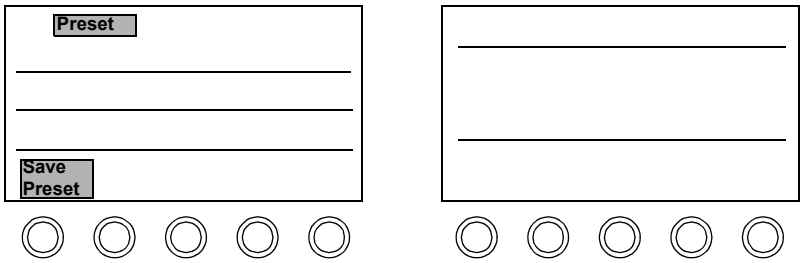


6. Type the name of the new preset into the **Create New Preset** window and select **Okay** and press Enter.

Storing Presets

You can store modified or newly created presets, and are only limited by the amount of available space on the touch panel. To store a modified or new preset, use the following procedure:

1. After you have finished modifying or creating a preset to your satisfaction (as described on page 3-4 or page 3-6), with **Preset** active, touch **Save Preset.**

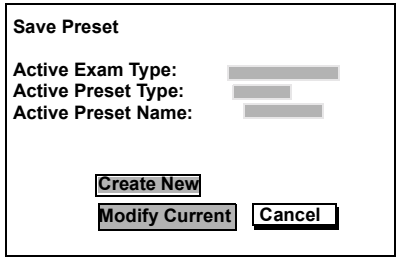


Tip: Also save new or modified presets to a floppy diskette, so you can restore them in case of a system failure. See "Floppy Drive" on page 4-3 for more information.

2. To save a modified preset, select **Modify Current** with the trackball and press **Enter**.

   To save a newly created preset, select **Create New** with the trackball and press **Enter**.

   To keep the current name, quickly press **Enter** twice or highlight **Okay** and press **Enter**. To rename the preset, type a new name and quickly press **Enter** twice, or highlight **Okay** and press **Enter**.



Copying Presets to a Different SONOS System

To copy presets from one SONOS system to another, do the following:

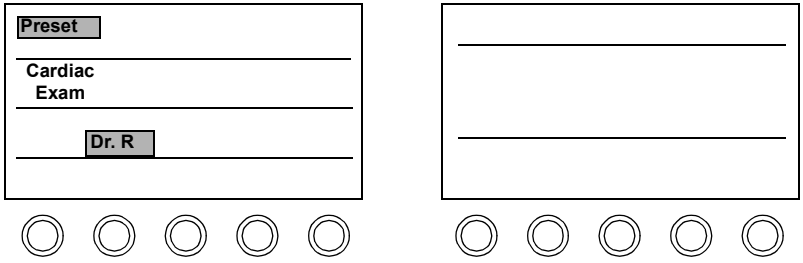
1. On the system that is currently using the preset, store the preset on a floppy diskette using the **Backup Preset** control.
2. Insert the diskette in the SONOS system that you want to upgrade.
3. Touch **Add Preset** (which is below **Restore Preset** on the touch panel).

   This adds all presets from the disk to the system's current presets. (Nonpreset files on the disk are ignored.)
4. If you did not want to add some of the presets on the disk, you can delete them from the system using **Delete Preset** (see "Deleting Presets" on page 3-10).

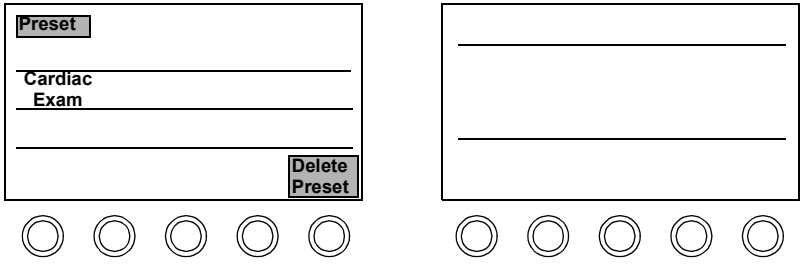
Deleting Presets

If the preset memory is full, you may have to delete a preset before creating new ones. You cannot delete Philips presets, but you can delete customized presets.

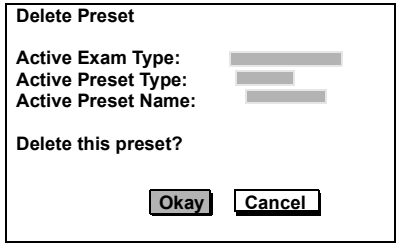
1. Touch the preset you want to delete.



2. Touch **Delete Preset**.



3. To confirm the deletion, highlight **Okay** with the trackball and press Enter. To retain it, highlight **Cancel** and press Enter.



4 Peripheral Devices

Introduction

WARNING **This system has been investigated to the requirements of IEC 601-1, with peripherals that are powered by the built-in isolation transformer. Anyone who uses the system with peripherals that are powered from a separate wall receptacle is considered to be configuring a medical system, and is therefore responsible that the system complies with the requirements of the IEC 601-1-1. If you have additional questions, contact your Philips representative.**

This chapter provides information about the SONOS

- System monitor (page 4-2)
- Floppy drive (page 4-3)
- Optical disk drive (page 4-5)
- PC (page 4-6)
- VCR (page 4-6)
- Printer (page 4-10)
- RS-232 interface (page 4-20)
- Remote service feature (page 4-22)

See the manufacturer's manuals for more details on the VCR and printer.

NOTE Optional peripherals shipped with your ultrasound system are configured at the factory to optimize ease of use and image quality. Operator's manuals from other manufacturers may describe additional features on those devices. Note, however, that modifying factory settings can potentially affect how those peripherals operate with your system. To ensure that peripherals work as designed with your system, it is recommended that you do not change peripheral settings.

System Monitor

Adjusting the Monitor Position

For information about adjusting the system monitor for user comfort, see “Adjusting the Monitor Position” on page 1-12.

Calibrating the Monitor

There are two versions of the SONOS monitor. You calibrate one using brightness/contrast dials. You calibrate the other using brightness/contrast push buttons. For instructions, see “Calibrating the Monitor” on page 1-13.

Floppy Drive

The Service Floppy drive allows you to

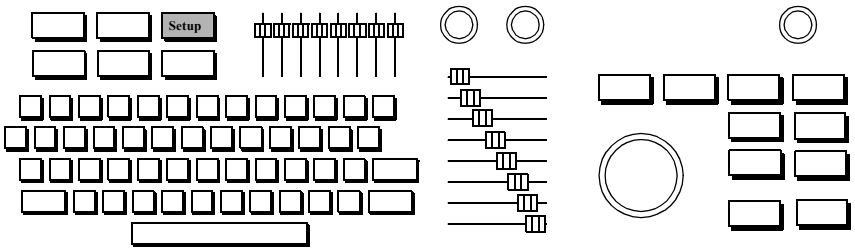
- Save and restore customized presets
- Format and erase floppy diskettes
- Upgrade software
- Install software options

Controls

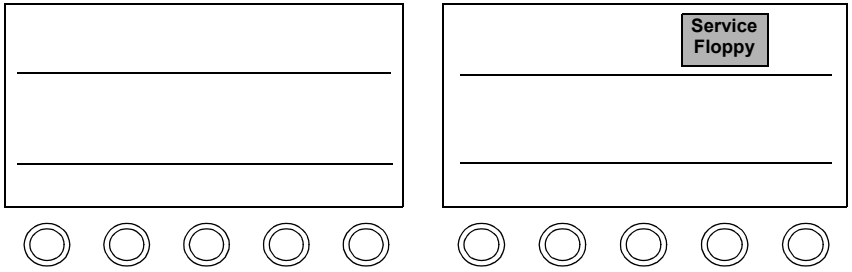
Add Preset	Reads a previously stored system configuration data set from disk.
Backup Preset	Saves system configurations, including presets and other settings, to a formatted floppy diskette. Screen instructions are provided.
Clear Diskette	Erases all disk files.
Format Diskette	Formats any manufacturer's 3.5" floppy diskette to DOS compatibility. If you have the Integrated Digital Interface option, you must turn the system off then on again after formatting a diskette.
Install Options	Installs optional software provided by Philips. Only used by Philips service organization.
Read Diskette	Reads text files stored on a floppy diskette.
Restore Preset	Retrieves previously stored system preset from the floppy diskette. Screen instructions are provided.
Upgrade Software	Installs system upgrade software provided by Philips. Only used by Philips service organization.

Accessing the Service Floppy Disk Drive

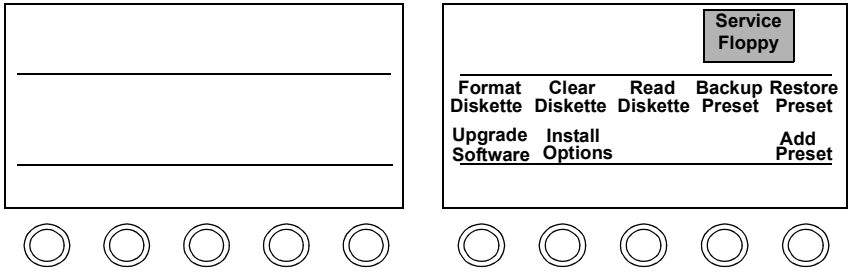
1. Press **Setup**.



2. Touch **Service Floppy**.



3. Select the option you want and follow the instructions. Press **Setup** to return to imaging.



Optical Disk Drive

Tip: Older SONOS systems may not be able to read data stored by newer SONOS systems on newer optical disks.

5 1/4-inch

The following table describes the optical-disk media that can be used with the SONOS system using a 5 1/4-inch optical-disk drive:

Drive	Revision	Media Compatibility and Capacity
4X	SONOS 7500/5500 A.0 through B.0	1X (read only) 600 MB 2X (read/write) 1.2 GB 4X (read/write) 2.3 GB
8X	SONOS 7500/5500 B.1 through D.0	1X (read only) 600 MB 2X (read only) 1.2 GB 4X (read/write) 2.3 GB 8X (read/write) 4.8 GB

3 1/2-inch

The following table describes the optical-disk media that can be used with the SONOS system, using a 3 1/2-inch optical-disk drive:

Revision	Media Compatibility and Capacity
SONOS 5500 B.1 and B.2	(read/write) 540 MB
SONOS 7500/5500 D.0	(read/write) 540 MB or (read/write) 2.3 GB

PC

A PC is installed on systems that receive the optional Live-3D imaging software. This PC allows users to perform the following Live-3D operations:

- Save study images to the PC disk.
- Review, retrieve, and delete studies that are stored on the PC disk.
- Export studies from the PC disk to the CD-ROM media.

For more information about these operations and about the PC's controls, see the *Using 3-Dimensional and BiPlane Imaging Guide*.

VCR

NOTE For information about using the VCR to videotape exams, see Chapter 6.

Controls

Primary

Color	Adjusts playback color intensity.
EJECT	Ejects the tape from the VCR.
FF	Rapidly advances a VCR tape.
Frame	Displays the next or previous tape frame. Available during playback, when **PAUSE** is on.
Mic	Enables and disables the microphone, to record external sound onto a tape.

PAUSE	Pauses and resumes recording or playback, without disengaging the VCR heads.
PLAY	Activates VCR playback.
RECORD	Indicates that the system is recording the display onto a VCR tape.
REW	Rapidly rewinds a VCR tape.
SEARCH	Pauses the VCR playback picture and puts the system into search mode.
Speed	Adjusts the tape search speed. Available when **SEARCH** is on.
STOP	Stops any active VCR operation.
Tape	Starts and pauses VCR recording.
Tape Find	Displays the frame specified. The format you enter must match the format used during recording (either the time format using **Tape Time** or the number format using **Tape Number**).
Tape Number	Lets you enter a number on the imaging screen that matches the number recorded on the VCR tape. **Tape Number** must be enabled in Setup to see this control as part of the VCR control set.
Tape Time	Lets you enter a time (hours, minutes, and seconds) on the imaging screen that matches the time recorded on the VCR tape. **Tape Time** must be enabled in Setup to see this control as part of the VCR control set.
VCR Play	Displayed on the right touch panel, this indicates that a VCR image is on the imaging screen. Touching **VCR Play** stops VCR playback and displays the previous format.

Setup

Blink, **Normal**, and **Inverse** are available for both **Tape Number** and **Tape Time**. With VCR highlighted, press Setup and select either **Tape Number** or **Tape Time**. Turn the rotary control beneath the highlighted selection to select **Blink**, **Normal**, or **Inverse**. Press Setup again to return to imaging.

Blink	Displays tape time or tape number in blinking numerics.
Inverse	Displays tape time or tape number in numerics within a shaded box.
Normal	Displays tape time or tape number in normal video display.
Tape Number	Enables **Tape Number**, for entering a number on the screen that matches the number recorded on the VCR tape.
Tape Time	Enables **Tape Time**, for entering a time (hours, minutes, and seconds) on the screen that matches the time recorded on the VCR tape.

VCR Troubleshooting

Tip: Always use high quality tapes for best results.

Symptoms	Suggestions
Tape controls do not display.	Make sure there is a tape in the VCR.
Cannot hear sounds on the tape.	Turn up the **Volume** control.
Images are too light or dark on playback.	Make sure the monitor ☼ and ◑ controls are correctly set. See "Calibrating the Monitor" on page 1-13 for details. For tapes recorded with color, adjust **Color** during playback.
Playback quality is inferior.	To obtain and view Super VHS images, record on a • Super VHS VCR (if your VCR has an S-VHS switch, be sure it is on) • Super VHS tape
Cannot view taped images.	Try viewing the tape on a Super VHS VCR. If a Super VHS tape was recorded in S-VHS, you can only view the images on a Super VHS VCR.
VCR images are printed on the wrong printer.	Press Setup, touch **Print**, and adjust **VCR [printer]** to display the printer to use for VCR images.

Printers

The SONOS system allows you to send an image to your local printer or to a networked DICOM printer.

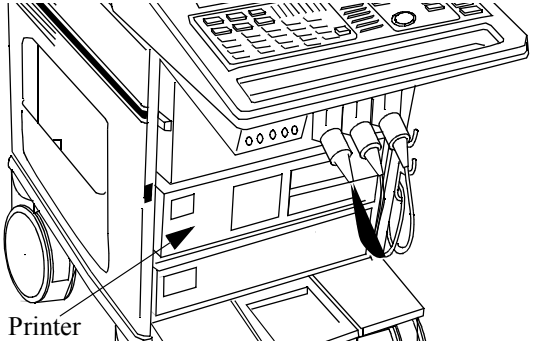
NOTE

The DICOM Print support option must be installed by your Philips Customer Engineer. The ultrasound system must include an Integrated Digital Interface (IDI) configured for DICOM networking. The system must also be configured for DICOM printers.

Printing an Image Locally

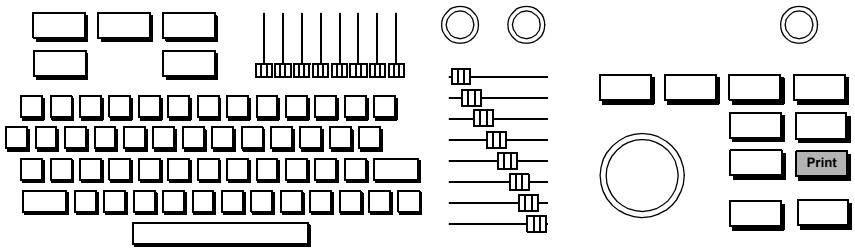
Use the following procedure to print using the SONOS printer.

1. Make sure the printer is on and has paper. Clean gel from your hands before loading paper.



Tip: If **Quad Format** is on in Setup, you must press **Print** four times to produce a four-image print.

2. Press **Print**.

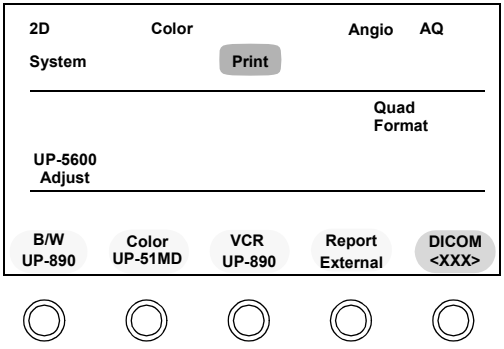


DICOM Printers

DICOM print allows you to print ultrasound still frames to a networked DICOM black and white or color printer. Images are automatically sent to the printer when the study ends. When **Network Autosend** is enabled, a sheet of images is printed when the sheet is full. If both color and black and white DICOM printers are configured, the system can automatically send images to the appropriate printer.

Setting Up DICOM Print

A **DICOM** rotary control appears on the **Setup Print** touch panel if the DICOM printer is available, and has either two or four positions, depending on the number of DICOM printers configured.



If only one printer is configured, the **DICOM** rotary control choices are

- **Off**—Disables DICOM print.
- **BW** or **Color**—Sends acquired images to the DICOM printer.

If the system is configured for both a color and a black and white DICOM printer, the DICOM rotary control choices are

Tip: The settings that you select must match the settings of the output device (external printer) that you want to use.

- **Off**—Disables DICOM print.
- **Auto**—The system sends acquired images to one of the DICOM printers, depending on the image type.
  - Monochrome images go to the DICOM black and white printer.
  - Doppler spectral images go to the DICOM black and white printer even if there is color in the reference section of the image.
  - Colorized images with color go to the DICOM black and white printer.
  - All other images with color go to the DICOM color printer.
- **BW**— All images print on the DICOM black and white printer.
- **Color**—All images print on the DICOM color printer.

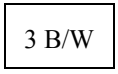
Using DICOM Prints

Acquiring Images

When DICOM print is enabled, pressing Acquire or touching **Acquire Frame** when a still frame is displayed places the current image in the queue for DICOM print. A print exposure indicator window is displayed for four seconds, at the bottom right of the imaging screen.

If **Network Autosend** is on, SONOS sends a preselected number of images to the printer. The images begin printing as soon as the printer has received the specified number of images. If **Network Autosend** is off, the images do not start printing until you touch **End Study**.

Example:



The exposure window shows the type of printer that will print the image and the image count sent to that printer from the current study. In the example shown, the system sends the image to the black and white DICOM printer, and the image is the third one acquired in the study.

NOTE Deleting an acquired image from system memory does not change the exposure count.

Retrieving Stored Images for DICOM Printing

Images stored on the system's hard disk or optical disk can be queued for DICOM printing by using the **Disk Retrieve** control in Loop mode. After **Disk Retrieve** loads an image into system memory, it can be printed to the DICOM printer when the current study ends, provided the **DICOM** rotary control is enabled.

1 Touch **Disk** on the left touch panel.

2 Touch **End Study** on the left touch panel.

3 The system

a. Saves all acquired still frames to disk.

b. Sends all acquired still frames to the DICOM printers.

c. Resets the print exposure counters to zero.

A network status window on the monitor shows the number of files being sent to DICOM storage, and the status of the printers and DICOM servers.

Example:

```
Store: 3
B/W: Done
Color: Unavail
```

In the example, three files are loaded in the IDI waiting to be saved to a DICOM storage device, all acquired black and white images were printed, and the DICOM color printer is unavailable.

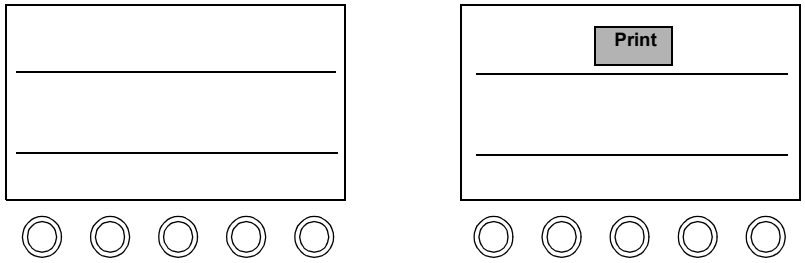
NOTE

Images are processed based on the **DICOM** rotary control settings in **Setup Print**, when the images are acquired. Changing the settings has no effect on images already stored in system memory.

Selecting a Different Printer

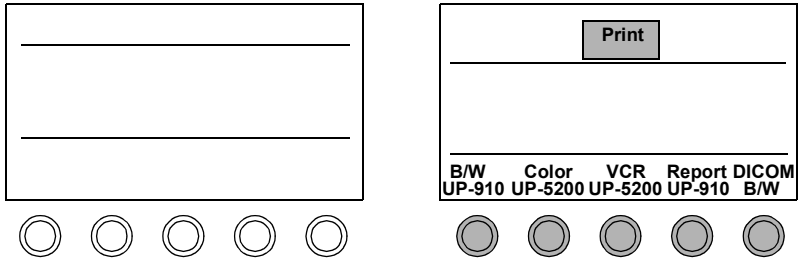
Use the following procedure to select the print device.

1. Press **Setup**, and touch **Print**.



Tip: If **External** appears on the screen, you can connect an external printer to the system.

2. Adjust controls to change where black and white, color, VCR, Report, or Serial Port pages are printed.

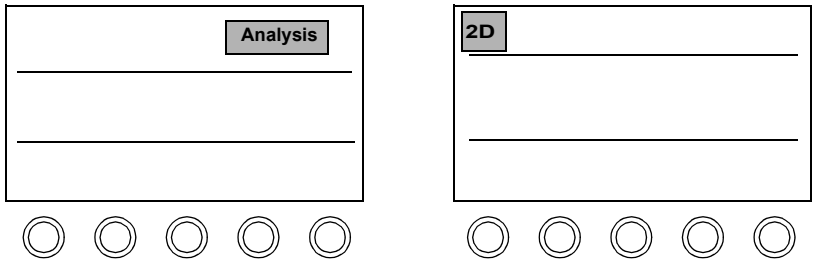


3. Press **Setup** to exit Setup mode.

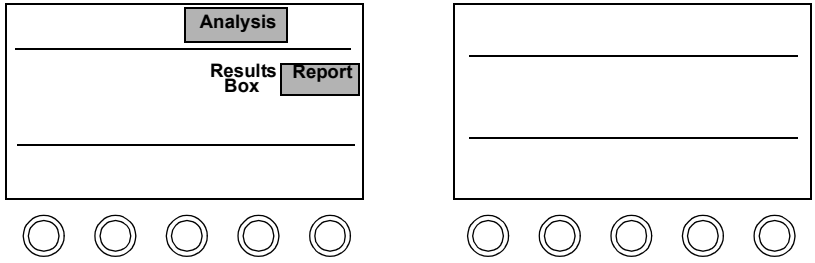
Printing an Analysis Report

After you complete configuring the RS232 interface, you can send analysis reports to an external printer or to a PC.

1. Touch **Analysis**.



2. Touch **Report**.



3. Press **Print**.

Printer Troubleshooting

Tip: Always use high quality paper for best results.

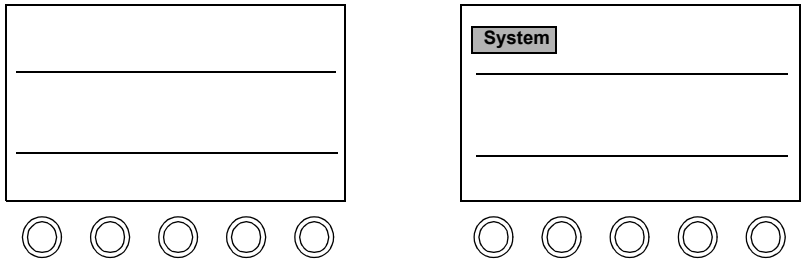
Symptoms	Suggestions
Paper jams during printing.	Fan the paper before loading it. Store paper flat. If it is curled, try to flatten it before loading. Make sure paper trays fit securely into the printer.
Prints have white lines.	Check the paper supply and remove any pieces with gel on them. Always clean gel off your hands before loading paper.
Four images print instead of one on a sheet.	Press **Setup**, touch **Print**, and touch **Quad Format** to turn off printing of four images per sheet.
Prints are coming out of the wrong printer, or are not printing at all.	Press **Setup**, touch **Print**, and adjust the appropriate control to change where the black and white, color, VCR, or Analysis report pages are printed.
Prints are blank.	Make sure the paper is inserted properly.

Symptoms	Suggestions
The colors do not look right.	Press Setup, touch **Print**, touch **UP-5xxx Adjust** (control name depends on printer), and alter the settings, as necessary. The default values for the UP-5200 are • Contrast – 6 • Brightness – 4 • Red, Green, Blue – 12 The default values for the UP-5600 are • Contrast – 2 • Brightness – 14 • Red – 7 • Green – 8 • Blue – 7
Black and white contrast or brightness is not ideal.	For black and white printers, consult the manufacturer's manual.

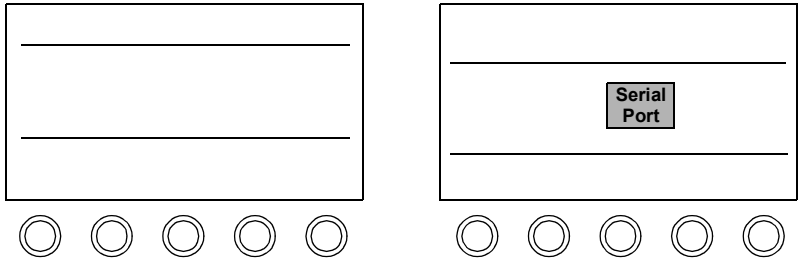
Configuring the RS-232 Interface

You can configure the RS-232 interface for sending analysis reports to either an external printer or a PC. The RS-232 interface is a 25-pin connector port located on the back of the ultrasound system (J1). See "Connecting the Ultrasound System to a Modem" on page 4-23.

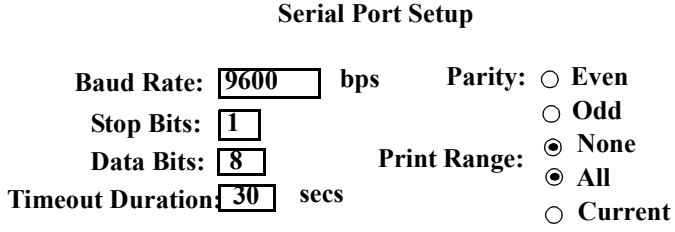
1. Press **Setup**, and touch **System**.



2. Touch **Serial Port**.



3. Use the trackball to highlight a setting, and make your selections by typing in the information. On the Serial Port Setup window, enter data such as baud rate, stop and data bits, and select parity and print range according to the external printer device that is connected.



4. Press **Setup** to finish and exit Setup mode. After you complete the setup and selection of the **Serial Port** for printing analysis reports, the system redirects the output of the analysis report to the serial port when you touch the **Print** controls.

Using the Remote Service Feature

This option may or may not be available in your local area. For details, contact your Philips Service Representative.

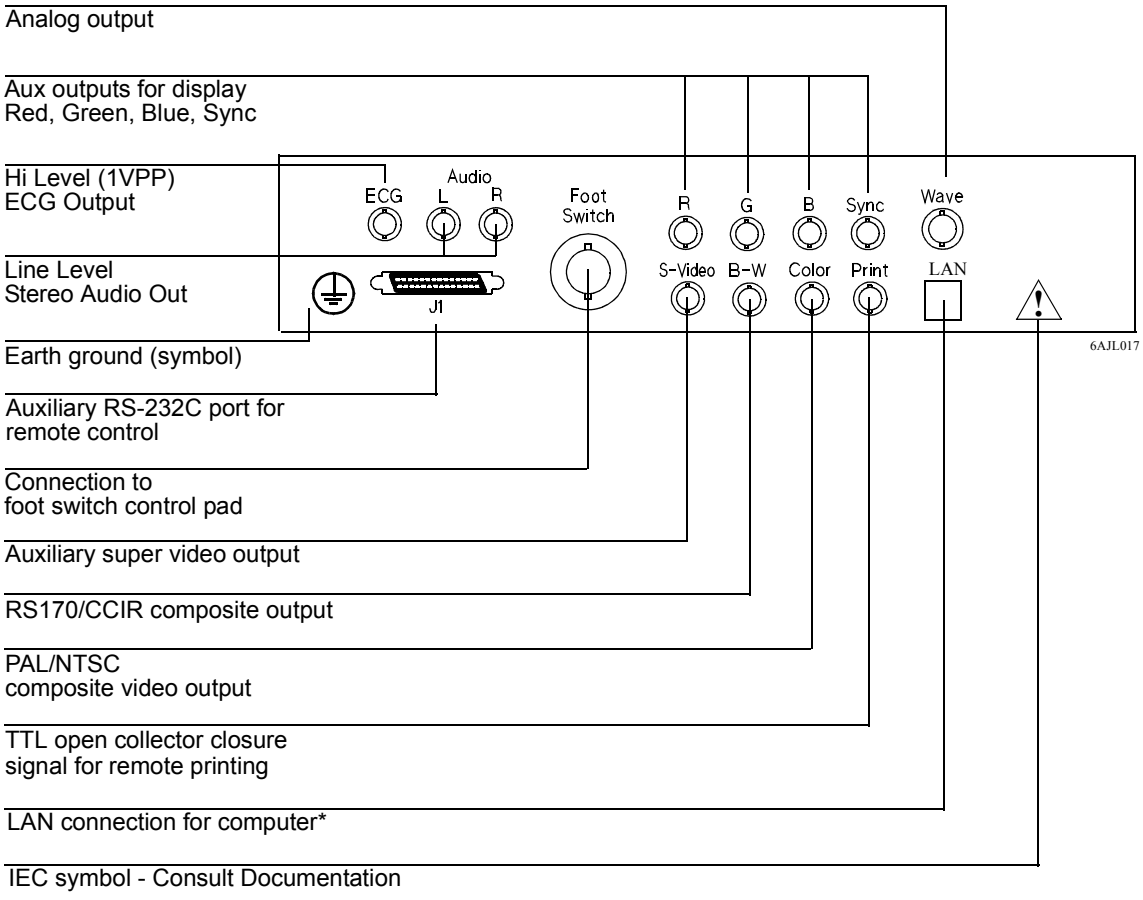
The Remote Service feature gives your Philips Service Representative access to the system via a modem.

This section describes how to use the Remote Service feature.

WARNING **DO NOT use the Remote Service feature or the modem while imaging a patient.**

Connecting the Ultrasound System to a Modem

1. Disconnect all transducers and other external peripherals.
2. Connect the modem to the RS-232C 25-pin connector port located on the back of the ultrasound system (J1).



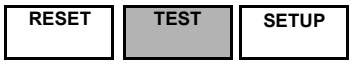
* Do not connect telephone to LAN connector.

For details on how to use the modem, refer to the manufacturer's documentation.

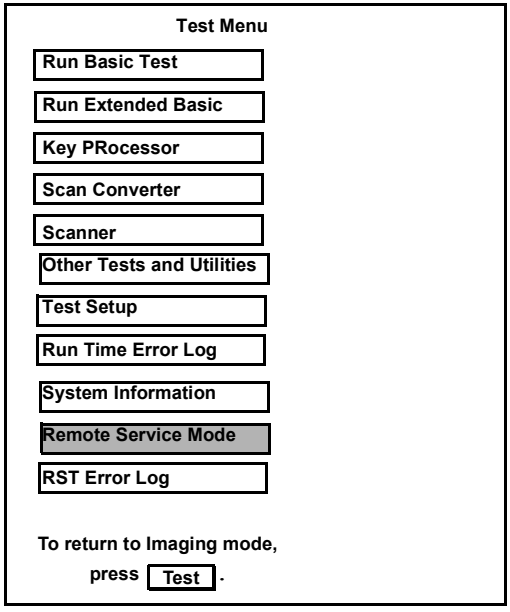
3. Connect the modem to a fax line, or to a dedicated analog phone line.
4. Turn on the modem. The system is now ready for Remote Service mode.

Selecting Remote Service Mode

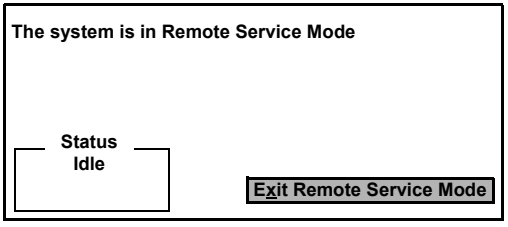
1. To access the Test Menu, press Test.



2. Use the trackball to select **Remote Service Mode** and press Enter.



3. After a short delay, the system displays a message indicating it is ready to accept a call from the local Philips Service Center.



Note that the information in the Status box is not an indicator that the Philips Representative is done working on the system.

While the system is being worked on, the Status box is updated:

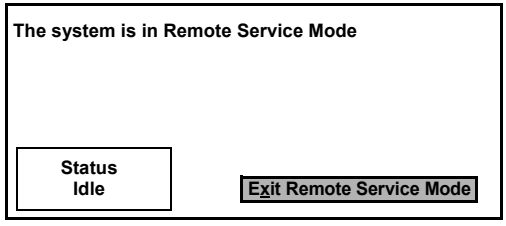
Idle	Indicates the system is not logged on to remote service.
Remote User Connected	Indicates the Service Center is connected to the system.
Working	Indicates the system is logged on to remote service, and is being worked on.

Exiting Remote Service Mode

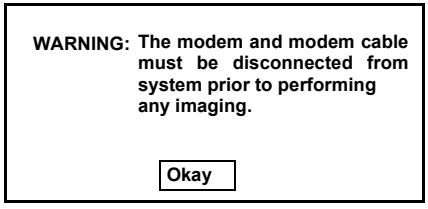
Note that if the Status box reads either **Remote user logged on**, or **Working**, and you disconnect the modem, delays in servicing the system can occur.

After your lab is notified by the local Service Center that the ultrasound system is ready to be used for imaging, follow these steps to return to live imaging.

1 Use the trackball to select **Exit Remote Service Mode** and press Enter.

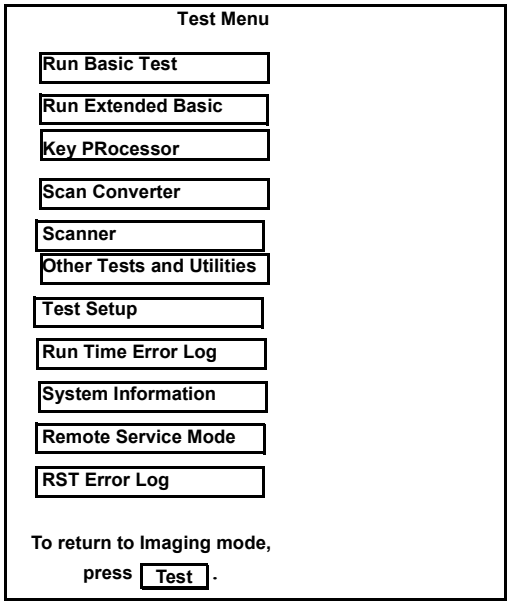


2 After the system warning message appears, highlight **Okay** with the trackball and press Enter.



3 Disconnect the modem from the system.

4 To exit from the Test Menu and return to Imaging mode, press Test.



5 To return to live imaging, touch 2D or another imaging mode.

WARNING **Make sure the modem is disconnected from the system before imaging a patient.**

5 Physios

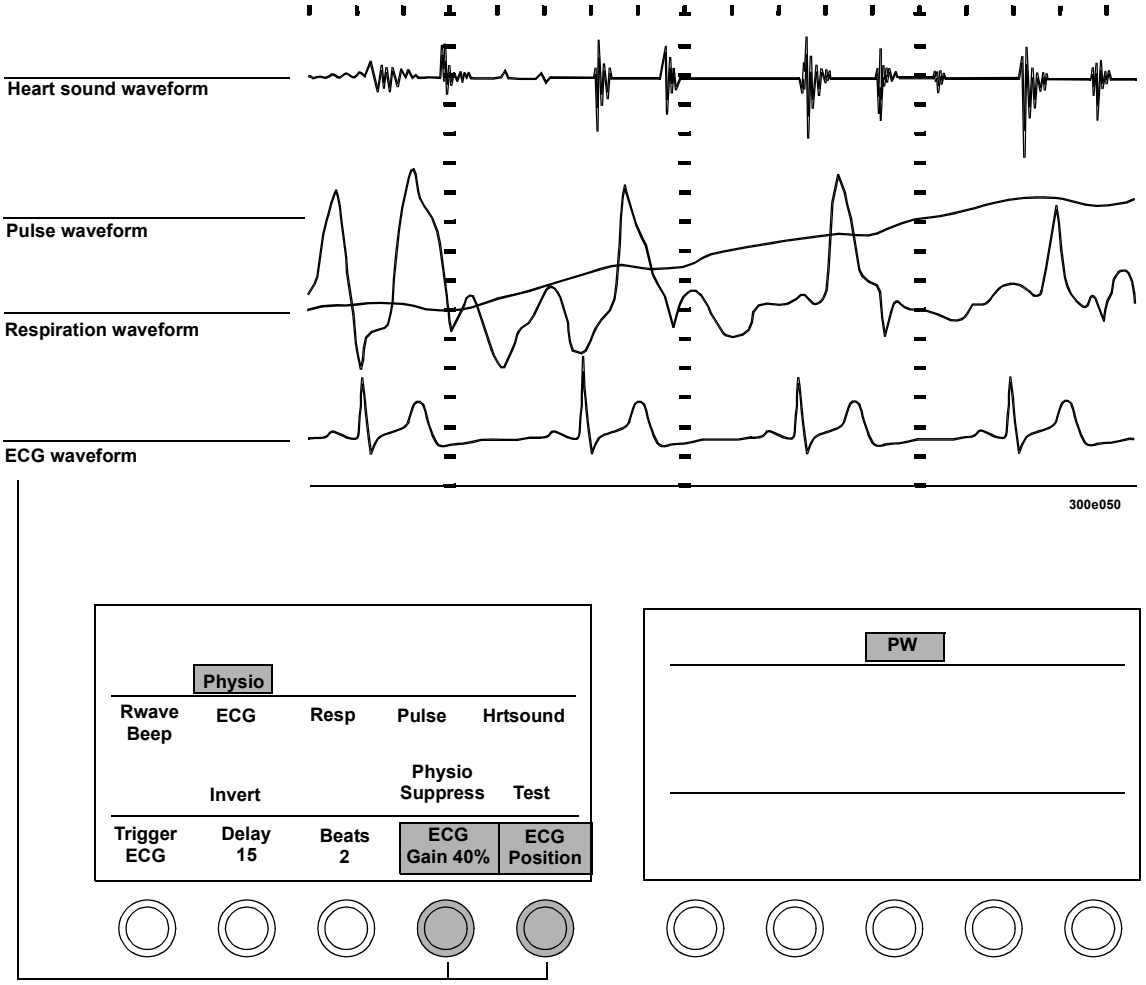
Introduction

Using SONOS physios, you can connect ECG and other physical sensors to the patient and monitor their heart sounds, pulse, respiration, and ECG waveforms in real time.

This chapter provides information about

- Physio imaging screen and touch panels (page 5-2)
- Physio controls (page 5-3)
- Setting up physios (page 5-7)
- Setting up triggering modes (page 5-8)
- Connecting physios (page 5-10)
- Viewing physios (page 5-12)
- Physio troubleshooting (page 5-14)

Screen and Touch Panels



Controls

Primary

Beats	When **Trigger ECG** is active, adjusts the number of beats between the triggered updates of a 2D, Color, Angio, or Spectral Doppler image.
AutoBeat Sequence	Defines the sequencing of R-wave acquisition of images in Triggering mode.
Delay	When **Trigger ECG** is active, updates the 2D, Color, Angio, or spectral Doppler image at a specified number of milliseconds after the R-wave.
ECG	Enables gain and position adjustment of the ECG waveform. In 2D, Color, and Angio, the waveform appears below the image and cannot be repositioned.
Gain	**[Gain ECG**, **Gain Pulse**, **Gain Resp**, or **Gain Hrtsound]** Adjusts the amplitude of the active waveform signal.
Hrtsound	Enables adjustment of **Hrtsound Gain** and **Position**. Activates the heart sound **Filter** control in Setup.
Interval	When **Trigger Timer** is active, adjusts the 2D, Color, Angio, or Spectral Doppler image update interval, in milliseconds.
Invert	Inverts the polarity of the ECG, Aux 1, Aux 2, and Resp waveforms.
Monitoring Mode	Turns on or off the low MI grayscale image in real time on the right side of a side-by-side display during a trigger beat acquire. Helps maintain the imaging plane without disrupting the contrast agent. Values are On/ Off. Only available in BW and Angio modes using the s3 transducer in TCE1 and TCE2. See *Using Contrast Imaging* for more information.

Tip: To suppress the ECG waveform, you must turn **ECG** off in Physio Setup.

Physio Suppress Turns **Hrtsound**, **Pulse**, and **Resp** physio waveforms on or off.

Position **[Position ECG, Position Pulse, Position Resp or Position Hrtsound]**
Adjusts the vertical position of the active waveform. Available in MMode, spectral CW and PW, and when Acoustic Quantification (AQ) waveforms are displayed.

Pulse Enables gain and position of the pulse waveform. Available in Color mode and Spectral Doppler.

Resp Enables adjustment of the respiration waveform, which displays movement of the chest during respiration. The respiration waveform is derived from the ECG leads.

RWave Beep Controls whether or not the system beeps during each R-wave. Not available in Doppler modes.

Test Puts a test signal through the currently active physio channel.

Trigger

Selects the triggering mode: **Off**, **ECG**, **Timer**, **Loop/ECG** or **Loop/Timr**. Trigger activates either **Beats** and **Delay** or time **Interval** for triggering 2D, Color, Angio, or Doppler (with or without spectral) updates.

Loop/ECG and **Loop/Timr** are available in **Contrast** or **AD** only.

With **Contrast** active, **Loop/ECG** lets you acquire the same portion of the cardiac cycle while the 2D, Color, or Angio image is displayed in real time. With **AD** active, **Loop/ECG** lets you acquire images while the 2D image is displayed in real time. Updates the acquisition based on the selected beats and delay.

With **Contrast** active, **Loop/Timr** lets you acquire images at a slower interval while the 2D, Color, or Angio image is displayed in real time. With **AD** active, **Loop/Timr** lets you acquire images while the 2D image is displayed in real time. Updates acquisition in milliseconds, based on selected intervals.

When **PW** is active, turning **Trigger** off activates simultaneous Duplex Doppler mode.

Setup

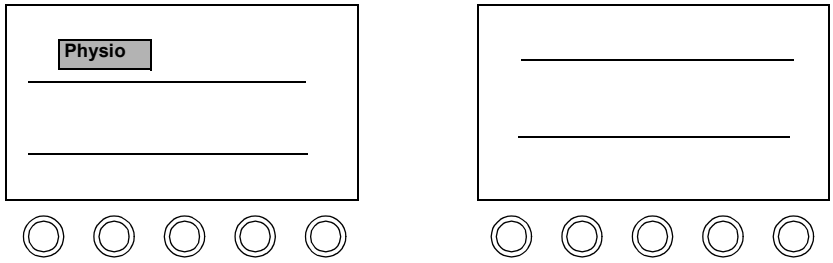
ECG	Selects an input source for the ECG waveform, or turns the waveform off.
ECG Output	Lets you take the ECG signal from the ECG output on the back of the system and use the signal as input to another device.
Filter	Removes frequencies below the hertz level specified. Only available when **Hrtsound Normal** is activated.
Hrtsound	Selects an input source for the heart sound waveform, or turns the waveform off.
Pulse	Selects an input source for the pulse waveform, or turns the waveform off.
Resp	Selects an input source for the respiration waveform, or turns the waveform off.
Rwave Output	Lets you take the ECG R-wave signal from the ECG output on the back of the system, and use the R-wave signal as input to another device.

For complete details about Physio controls for contrast imaging, see *Using Contrast Imaging*.

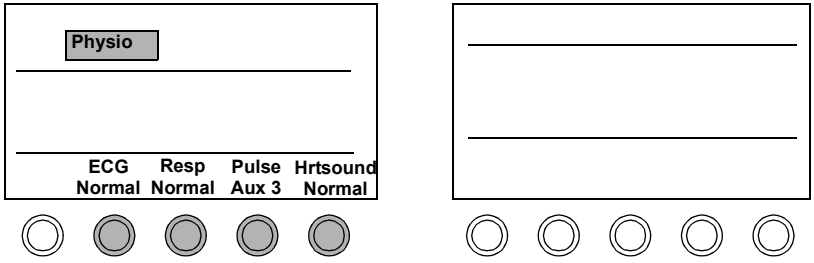
WARNING **Do not use ECG patient cables with detachable lead wires that have exposed male pins. Electrocution could result if these pins are plugged into an AC power.**

Setting Up Physios

1. Press **Setup**, and touch **Physio**.



2. Turn the rotary controls to adjust the Physios setup for the waveforms you want to view, or turn the rotary control to Off for those that you do not need. Turn **Normal** to obtain the signal from a physio transducer connected to the system, or **AUX** for an auxiliary signal from another source.

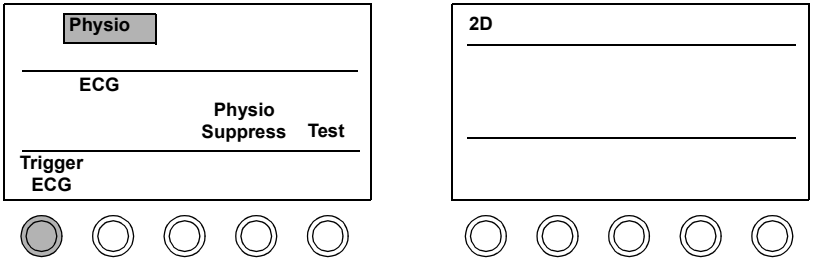


3. Press **Setup** to exit Setup mode.

Setting Up Triggering Modes

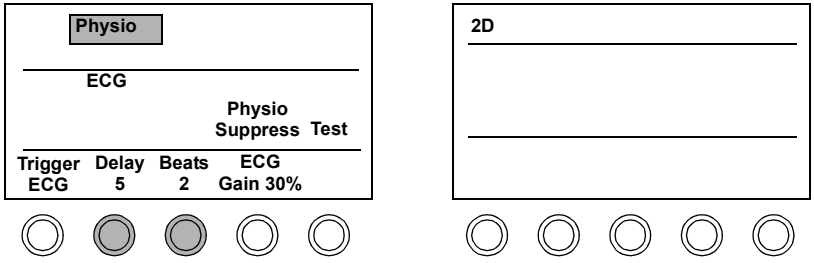
1. Touch **Physio**.

2. Use the **Trigger** rotary control to select **ECG, Timer, Loop/ECG,** or **Loop/Timr** mode. (**Loop/ECG** and **Loop/Timr** only appear if **Contrast** or **AD** is on. For complete details, see *Using Contrast Imaging*).



Tip: To retain **Trigger Beats**, **Delay**, and **Interval** settings, save them to a preset. Triggering presets depend on study type and imaging mode.

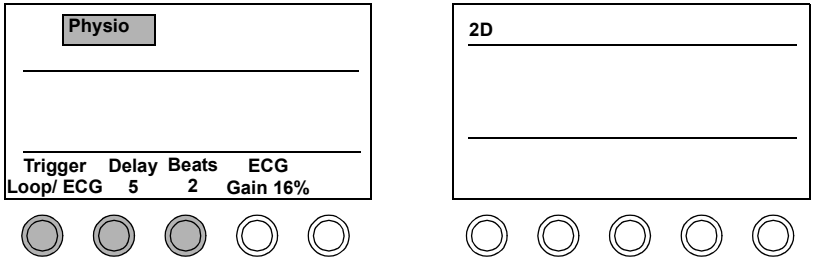
3. Adjust **Delay** and **Beats** (or **Interval** if **Trigger Timer** is active) to set up triggering.



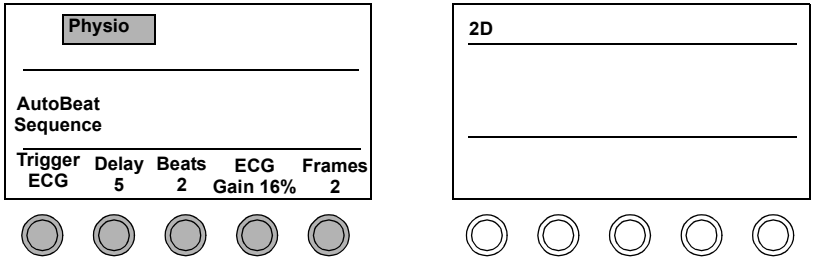
NOTE In PW and CW, if no R-wave is present, the ECG trigger does not appear.

Tip: Triggered images can only be acquired in Contrast and AD modes.

4. Turn the **Trigger** rotary control to **Loop/ECG** or **Loop/Timr** in Contrast or AD mode, to view a real-time image and acquire triggered images.



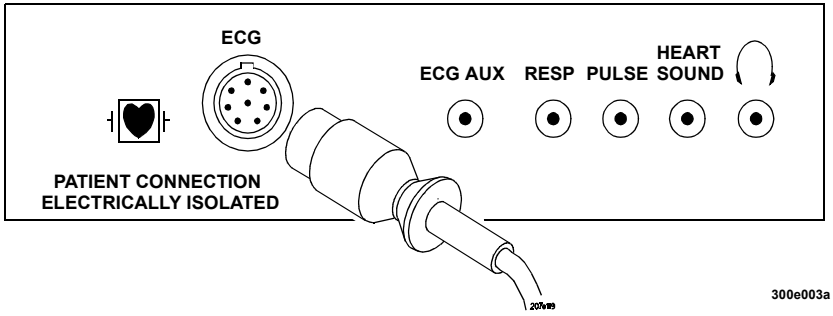
5. Turn the **Trigger** rotary control to **Trigger ECG** in Contrast mode. The **Frames** control appears and the system goes into Multiple Frame Triggering mode (MFT). See *Using Contrast Imaging* for more information about MFT.



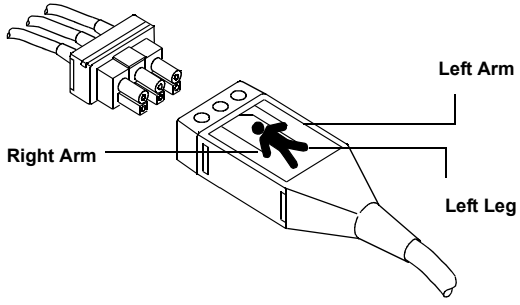
Connecting Physios

NOTE Your system may not have all of the physios shown.

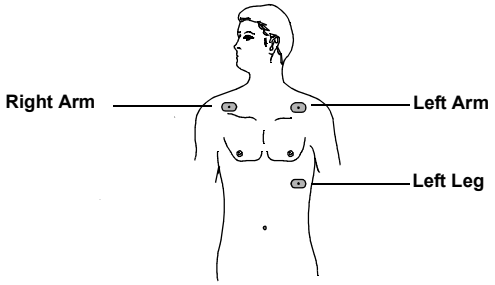
1. Make sure that **ECG Normal** is displayed in Setup. Insert the ECG cable connector into the ECG receptacle under the keyboard.



2. Connect the pin connector to the ECG cable.

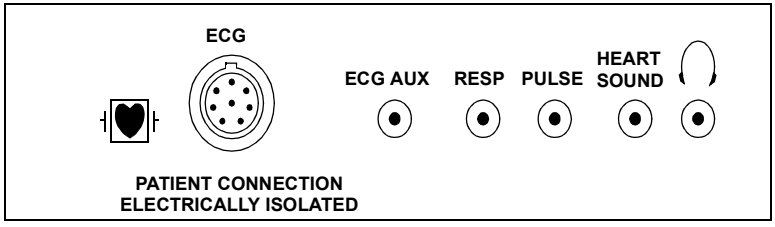


3. Attach the electrodes and ECG leads to the patient as shown. Proper ECG lead placement is critical for receiving a good ECG and respiration signal.



NOTE Lead placements in the drawing above are anatomically incorrect; however, this placement obtains optimal triggering for AQ, CK, AD, and 3D.

4. Connect and attach cables for other physios you want to use. Make sure Setup values match the connections.

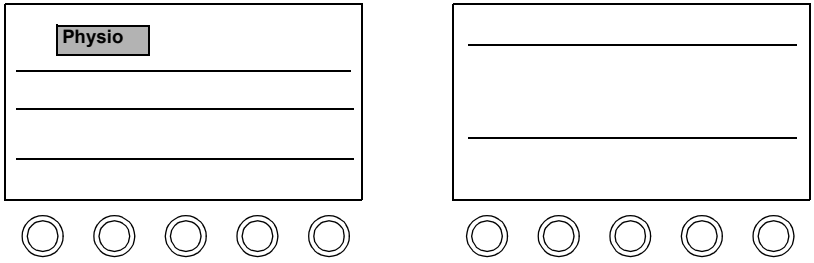


Viewing Physios

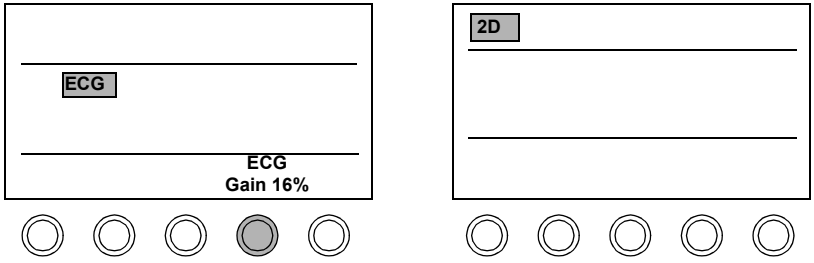
NOTE

The Pulse waveform is unavailable in 2D, Color, Angio, nonspectral Doppler modes, and AQ.

1. Touch **Physio**. Only waveforms that you have set up appear. **Physio Suppress** must be off to see all available waveforms.

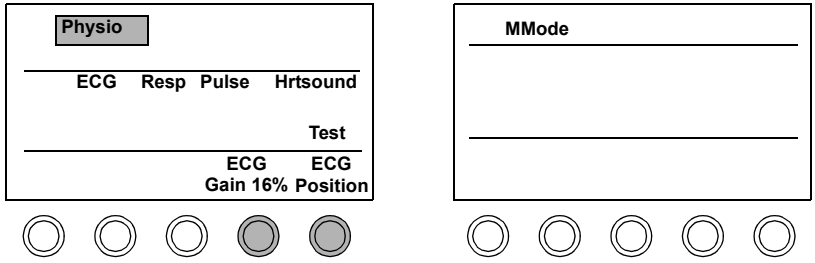


2. Verify that the ECG complex size is correct for each mode by touching the mode (**2D**, **MMode**, **PW**, **CW**, or **AQ**) and **ECG**. To set the size of an active trace, adjust the **Gain** rotary control.



3. Check the trace positions by touching each mode and then each waveform you want to see in that mode. Only one waveform control can be active at a time. The **Gain** and the **Position** rotary controls pertain to the active waveform.

If an active Trace is not displayed, touch **Test**. If necessary, adjust **Position**.



Physio Troubleshooting

Always make sure that the active preset is appropriate for the study being performed.

Symptoms	Suggestions
Physio does not display.	For physios other than ECG, make sure **Physio Suppress** is off. Check to ensure the physio cable is secure in the correct connection and is correctly attached to the patient. Touch **Test** to test physio signals. For ECG and respiration signals, check the patient cable, the connection to the system, the electrodes, and the lead placement. Adjust **Gain** and **Position** controls for the active waveform. If there is no touch control for the physio waveform you want to view, press Setup, and make sure this physio is set to **Normal** (for a physio transducer connected to the system) or **Aux** (for an external signal connected).
Too many physios display.	With **Physio** active, press Setup, and set the physios you do not want to see to Off.
Waveform is too big or too small.	Adjust the physio **Gain** and **Position** controls for the active waveform.
The ECG or respiratory waveform contains an artifact or wanders	Follow the electrode manufacturer's suggestions for skin preparation. Put a little gel on the electrodes. They might be dry. Reconnect the lead to the electrode, and check the electrode placement on the patient.

Symptoms	Suggestions
2D reference image does not update	Make sure **2D Hold** or **BMode Hold** is off in CW and PW modes. Verify that Freeze is off. Verify that the ECG leads are connected properly. Adjust **Delay** or **Beats** rotary control if an R-wave is present, or **Interval** rotary control if there is no R-wave (all **Physio Trigger** controls). Adjust **ECG Gain** rotary control.
System does not stop beeping	Touch **RWave Beep** to turn off the beep during each R-wave.
Waveform shape is wrong	Make sure each physio cable is secure in the correct connection on the system, and that touch controls match your selections. For example, for ECG and Pulse waveforms, Physio Setup should show **ECG** and **Pulse** set to **Normal** to obtain the signal from a physio transducer connected to the system, or to **AUX** for an auxiliary signal from another source.

6 Doing Exams

Introduction

This chapter outlines the basic steps for performing an ultrasound imaging exam. The basic procedure is to:

- Select a preset (page 6-1)
- Set up the exam (page 6-2)
- Connect a transducer (page 6-10)
- Optimize the image (page 6-10)
- Videotape the exam (page 6-11)
- Store the image (page 6-15)
- Send the image over a network (if desired) (page 6-15)

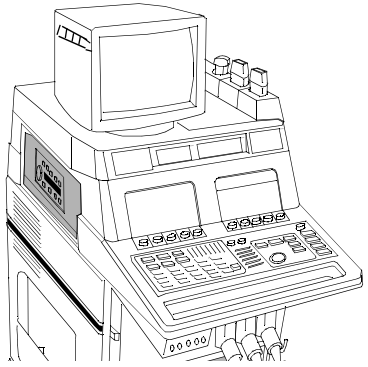
The following sections walk you through this procedure.

Selecting a Preset

For information about selecting an exam preset, see Chapter 3.

Setting up the Exam

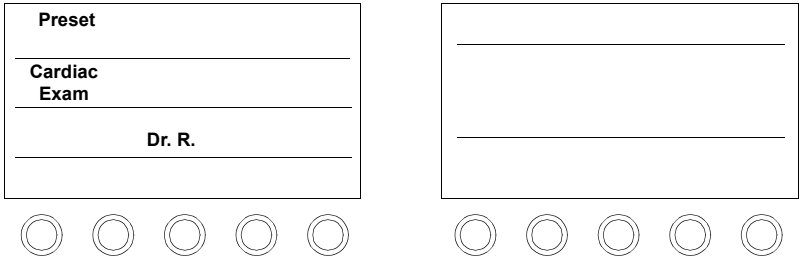
1. Make sure all peripherals are on and the recording medium is correctly inserted.



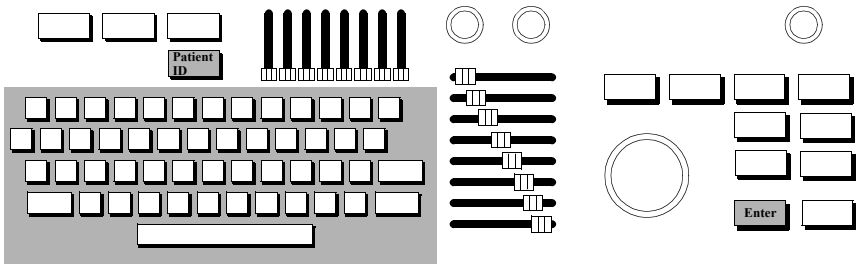
NOTE

You can operate the VCR using the controls on the touch panel. See Chapter 4 for more information.

2. Select or reselect the preset to match the study you are about to perform. The active preset is shown on the screen, unless you touch **Preset Name** on the left touch panel to turn off the preset display.



3. Press **Patient ID** to display the **Patient Information** window. The window is preset-dependent. It contains information pertinent to the exam type.



NOTE

Patient information is automatically stored to the Analysis report, and can only be edited on the **Patient Information** window.

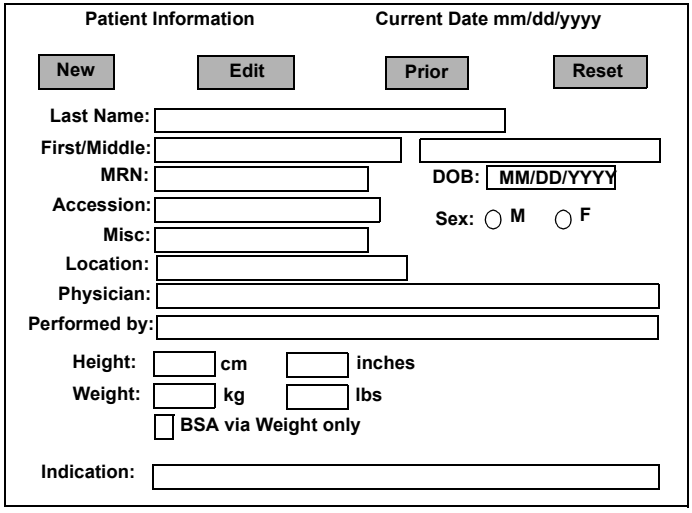
4. To enter new patient data:

a. If a **PATIENT SELECTION** window is onscreen, highlight **Manual Entry** and press Enter.

b. Highlight **New** and press Enter.

c. Type in the new patient information. A red box outlines the active field. To move from field to field, use the trackball.

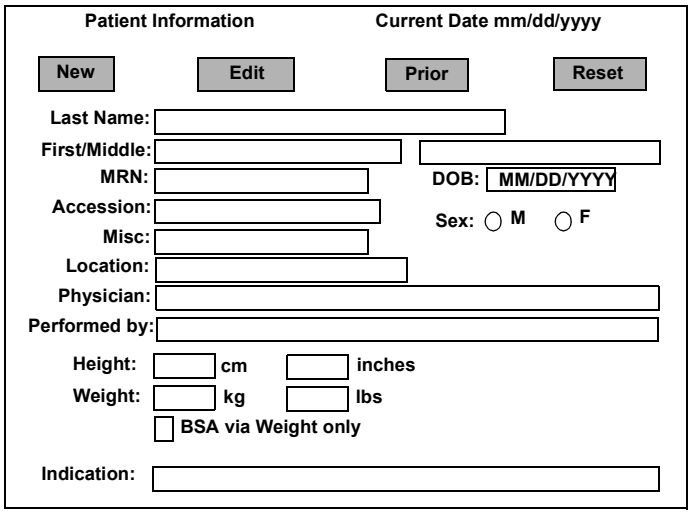
Note: The MRN is the Medical Record Number.



NOTE

Select **Prior** to display the patient data that was previously on-screen. **Prior** only retrieves one previous information display. See the *Using Integrated Digital Interface (IDI) User's Guide* for information on how to enter and retrieve patient information on systems with the IDI option.

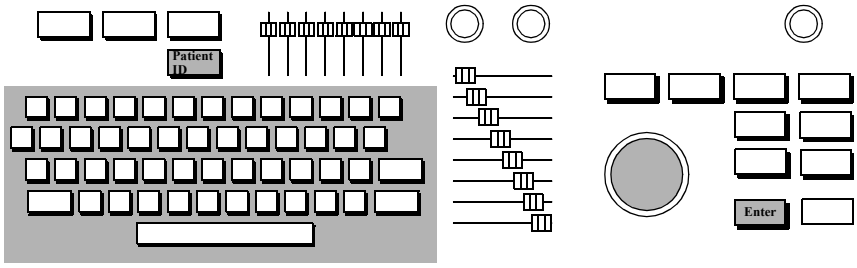
5. To edit patient data, highlight **Edit** and press Enter. Type in your changes.



NOTE

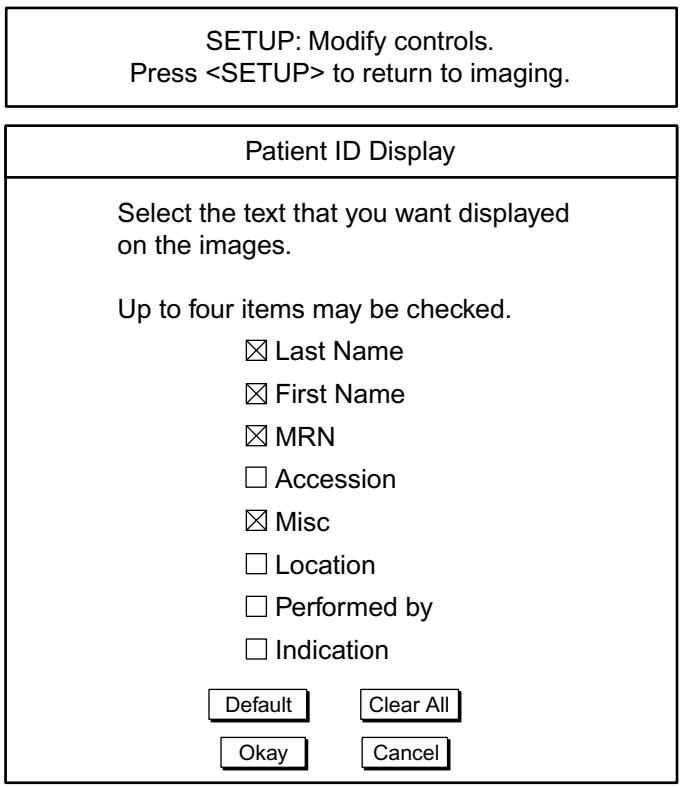
The current date shows the system setup date; see Chapter 1 for details. This date is used to calculate the patient age for EnConcert and Analysis reports. If the date is incorrect, the patient age will be incorrect.

6. To enter this patient information and return to live imaging, press **Enter** twice, or press **Patient ID**.



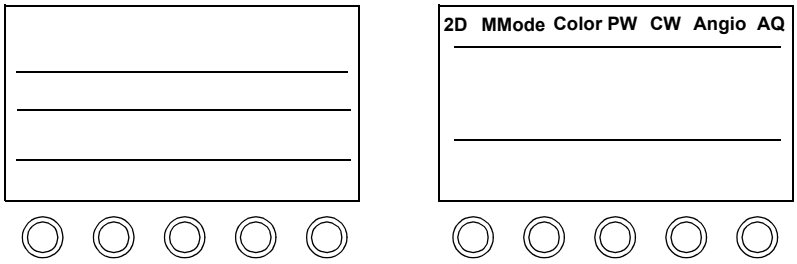
7. To specify the information that will appear on the screen, press **Setup**. Then touch **System** on the right touch panel and **ID Display**. Use the trackball to select the patient identification information that will be displayed on the screen.

   Note: The **Misc** field matches the **Misc** field on the **Patient Information** window.

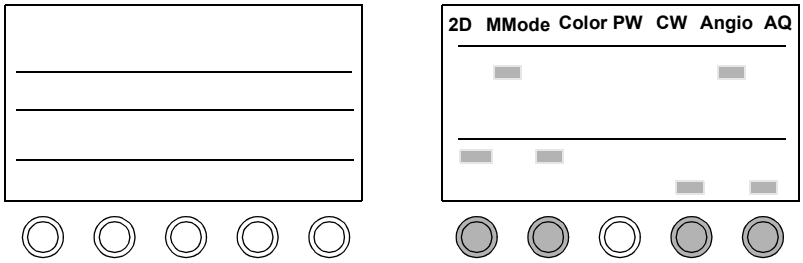


To close this window, press **Setup**.

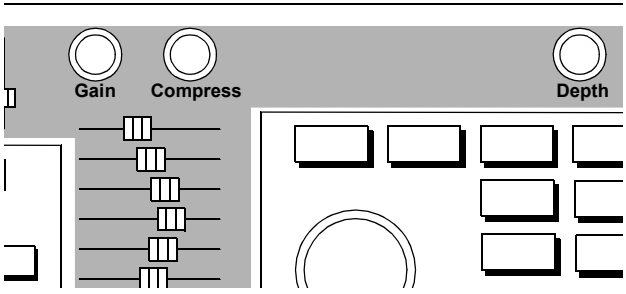
8. Touch the mode you want to use. (If a noncardiac preset is active, the **BMode** touch control appears instead of the **2D** touch control.)



9. Touch any of the mode-specific controls that are displayed. See the section on the mode you are using for detailed information.



10. Adjust imaging controls applicable to this mode, as necessary. General imaging controls are described in Chapter 7



Connecting a Transducer

For information about connecting transducers and physio sensors to the SONOS system, see Chapter 2 and Chapter 5.

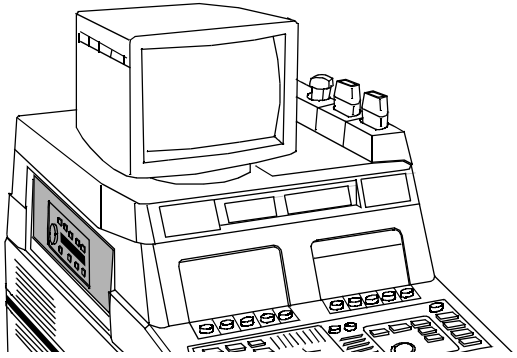
Optimizing the Image

For information about optimizing images, see the specific imaging-modality sections in Chapter 7.

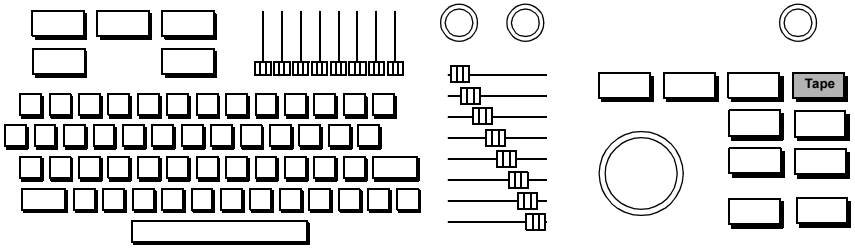
Videotaping the Exam

Tip: The tape icon appears on the imaging screen when a tape is in the VCR.

1. Make sure the VCR is on, and that a tape is in. To record time or frame numbers, touch **Tape Time** or **Tape Number** (only one appears, depending on what you select in Setup.)

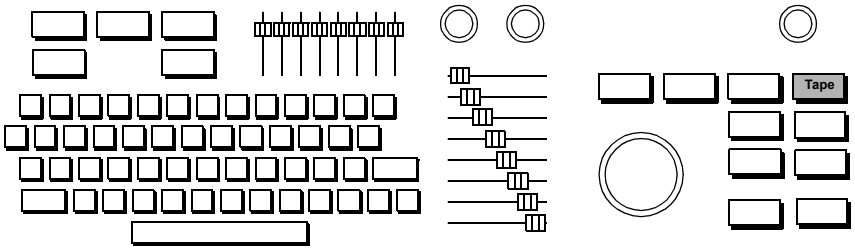


2. To begin taping, press **Tape**.



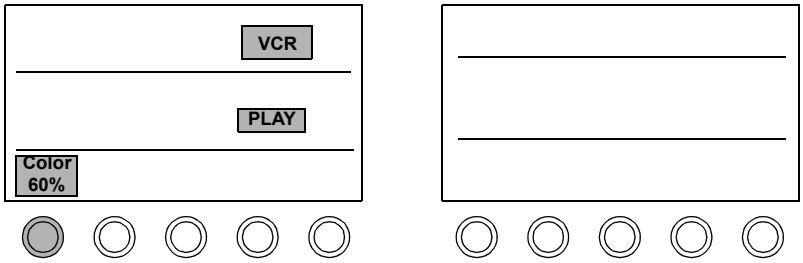
Tip: The VCR is turned off automatically when you turn off the system.

3. When you are done recording, press **Tape**. If you are using the foot switch, press **Record** to pause taping.

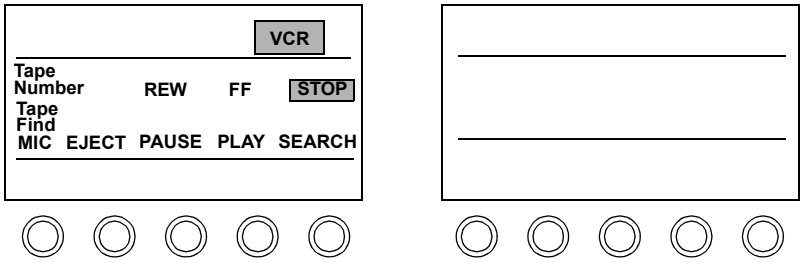


Viewing Taped Images

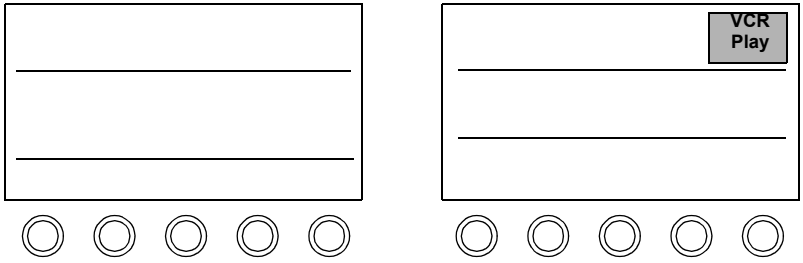
1. With the VCR on and a tape inserted, touch **PLAY**. If necessary, use **Color** to adjust the intensity of color recorded on a tape.



2. Use SONOS controls, as necessary, to view specific segments. To make measurements on taped images, first follow the steps in "Calibrating Videotaped Images for Measurement" on page 9-22.



3. To return to the previous format, touch **VCR Play**.



VCR Troubleshooting

Tip: Always use high quality tapes for best results.

Symptoms	Suggestions
Tape controls do not display.	Make sure there is a tape in the VCR.
Cannot hear sounds on the tape.	Turn up the **Volume** control.
Images are too light or dark on playback.	Make sure the monitor ☼ and ◑ controls are correctly set. See "Calibrating the Monitor" on page 1-13 for details. For tapes recorded with color, adjust **Color** during playback.
Playback quality is inferior.	To obtain and view Super VHS images, record on a • Super VHS VCR (if your VCR has an S-VHS switch, be sure it is on) • Super VHS tape
Cannot view taped images.	Try viewing the tape on a Super VHS VCR. If a Super VHS tape was recorded in S-VHS, you can only view the images on a Super VHS VCR.
VCR images are printed on the wrong printer.	Press Setup, touch **Print**, and adjust **VCR [printer]** to display the printer to use for VCR images.

Storing the Image

For information about storing images, see Chapter 11 and Chapter 12.

Sending the Image Over a Network.

For information about sending images over a network, see Chapter 12.

7 Imaging Modalities

Introduction

This chapter provides information about how to use the SONOS system

- General Imaging Controls (page 7-2)
- Frequency Fusion Imaging (page 7-4)
- Harmonic Fusion Imaging (page 7-8)
- Zoom Mode (page 7-15)
- Dual Imaging Mode (page 7-19)
- 2D Imaging (page 7-23)
- 2D/BMode Imaging (page 7-30)
- MMode Imaging (page 7-48)
- Color Imaging (page 7-60)
- PW and CW Imaging (page 7-79)
- Angio Imaging (page 7-108)
- Doppler Imaging (page 7-121)

These sections provide detailed information about each mode's screens, touch panels, controls, procedures, and image optimization.

This chapter does not discuss

- Live-3D and BiPlane Imaging (see the *Using 3-Dimensional and BiPlane Imaging Guide*)
- Contrast Imaging (see the *Using Contrast Imaging Guide*)
- Acoustic Quantification (AQ) (see the *Using Acoustic Quantification Guide*)
- Acoustic Densitometry (AD) (see the *Using Acoustic Densitometry Guide*)

General Imaging Controls

The controls described in this section pertain to all modes, unless otherwise specified.

Compress	Adjusts the dynamic range of returning echoes, thereby affecting the 2D/BMode or the MMode.
Depth	Adjusts the vertical acoustic field of view for the structure being imaged. Increasing the depth setting decreases the frame rate.
Focus	Repositions the acoustic depth of the 2D/BMode focal zones, indicated by carets.
Freeze	Freezes and unfreezes the display.
Frequency Fusion	Optimizes frequencies for penetration, texture, or resolution. Changes are reflected in the Frequency Fusion icon and on the process line displayed at the top left corner of the screen.
Gain	Adjusts the amplification of received acoustic signals. Received gain values range from 0 to 100. Used in 2D/BMode and MMode.
LGCs	(Lateral Gain Controls) Each of the eight sliders adjusts the amplification of returning signals within a specific lateral 2D/BMode or AQ image area. Available only with sector and curvilinear array transducers.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Position	In conjunction with the trackball, repositions the active 2D/BMode, Zoom, or color area.
Size	In conjunction with the trackball, resizes the active area.
Spectral	Reformats the screen display to turn a Doppler spectral trace on or off.

TGCs

(Time Gain Compensation controls) Each of the eight sliders adjusts the amplification of returning 2D/BMode and AQ signals at a specific image depth. Adjust the TGCs in a smooth curve to compensate for acoustic attenuation.

Trackball

In conjunction with **Size**, resizes the active 2D/BMode, Zoom, or color area. In conjunction with **Position**, repositions the active area. In conjunction with **Enter**, repositions the MMode line, the Doppler cursor, the PW sample volume, or the CW focal point (diamond).

Zoom

Turns zoom (magnification) mode on or off. To move the zoom preview area, use the trackball (**Position** is active when you first enter zoom preview). To resize the zoom preview area, press **Size** and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

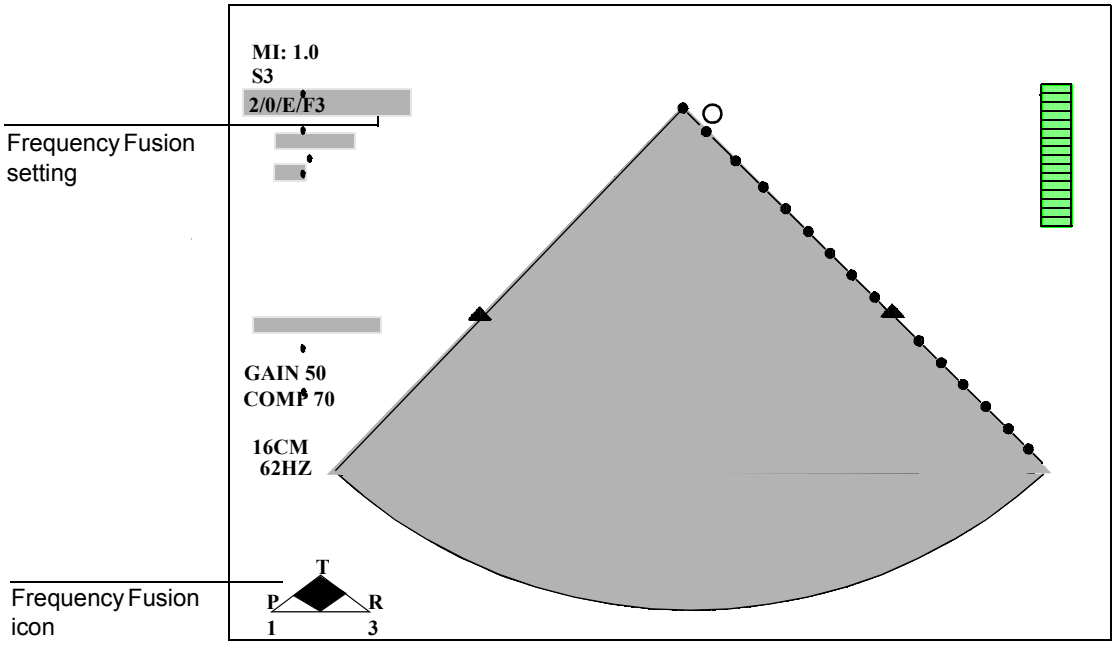
Frequency Fusion Imaging

Introduction

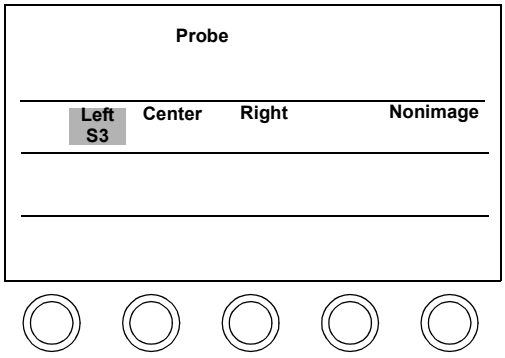
Frequency Fusion settings control the transducer frequencies that are used to generate 2D images. The SONOS system offers up to five settings, which depend on the transducer and configure it for the optimum combination of

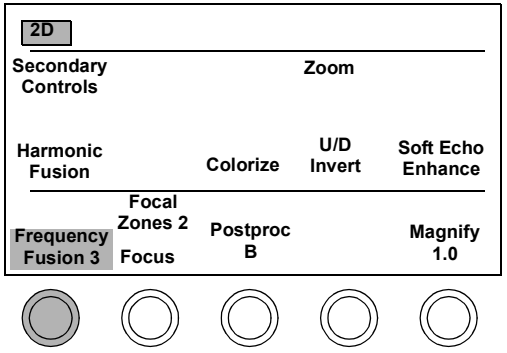
- Penetration (primarily using low transducer frequencies)
- Resolution (primarily using high transducer frequencies)
- Tissue texture (using blended low and high transducer frequencies)

Screen and Touch Panels



300e004

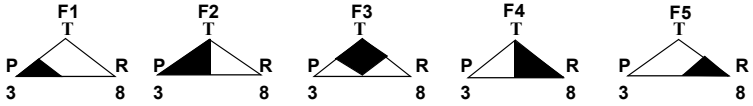




Icons

The Frequency Fusion icon represents 2D image quality changes between penetration (P), texture (T), and resolution (R).

- When the blue triangle is on the left side, penetration is optimized.
- When the blue triangle is on the right side, resolution is optimized.
- When the blue triangle is in the center, this denotes a blended balance resulting in optimal tissue texture (T).



The following list describes the values for these icons:

- P = Penetration (low frequency imaging)
- T = Texture (blended low and high frequency)
- R = Resolution (high frequency imaging)
- 3, 8 = Approximate range of frequencies that contribute to the image

Controls

Frequency Fusion (Rotary Control)	Selects the Frequency Fusion setting. Changes are reflected in the Frequency Fusion icon and on the process line displayed at the top left corner of the screen. Not available when the image has been frozen using the Freeze key.

Using Frequency Fusion

To change the current transducer's Frequency Fusion setting

1. If the **Harmonic Fusion** control is highlighted in the right touch panel, touch it to turn Harmonic Fusion off.
2. Turn the **Frequency Fusion** rotary control knob (below the right touch panel) to select a new setting.
3. Check the Frequency Fusion icon on the imaging display screen, to confirm that it shows the desired setting.

The following restrictions apply to Frequency Fusion:

- Frequency Fusion operates on any unfrozen, real-time, 2D image.
- Frequency Fusion icons do not appear in Doppler spectral trace modes.
- The number of rotary-control settings varies with the transducer.

Harmonic Fusion Imaging

Introduction

Harmonic Fusion for tissue provides improved visualization of the endocardial border, particularly with patients who are difficult to image. Harmonic Fusion imaging activates harmonics for a 2D image only—all Doppler modes remain at the fundamental frequency.

Following are some Harmonic Fusion guidelines:

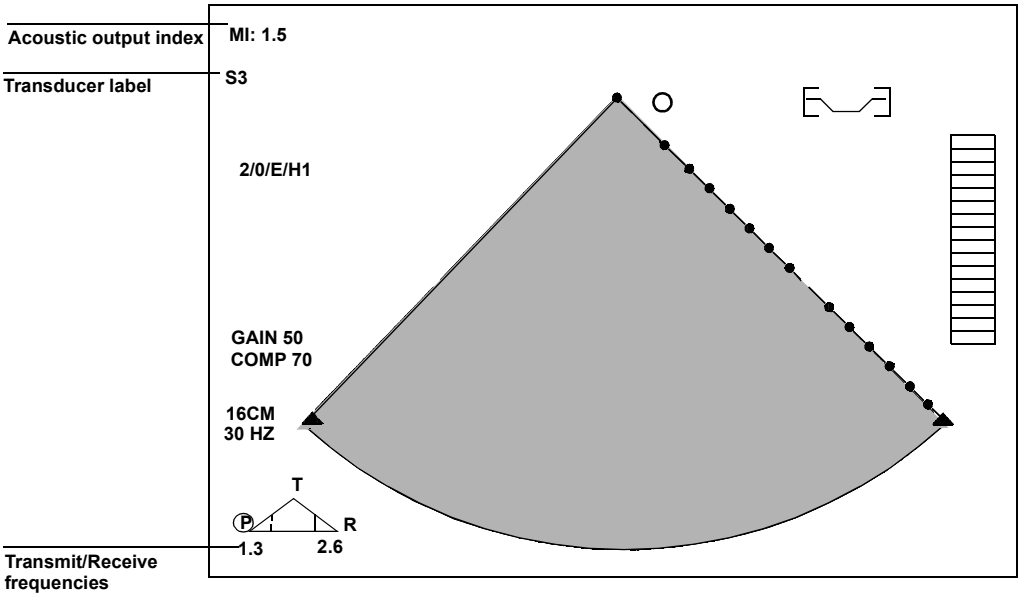
- You are required to use a harmonics-ready transducer, such as the s3, s4, s8, 11-3L, c3540, OmniPlane III, or x4.
- When using Harmonic Fusion imaging, the **Power** control on the secondary touch panel affects transmit power.
- A maximum frame rate of 30 Hz (25 Hz for PAL systems) is used. There are exceptions, such as with the s3 transducer, which allows higher frame rates in Harmonic Fusion setting 5.
- Harmonic Fusion is available with cardiac exam presets, the transcranial preset, and the following abdominal presets: abdominal, vascular abdominal, small parts, and renal. Harmonic fusion is also available with vascular-carotid, PV, low-extremity, and upper-extremity exams and presets. The available exams and presets depend upon the transducer type.

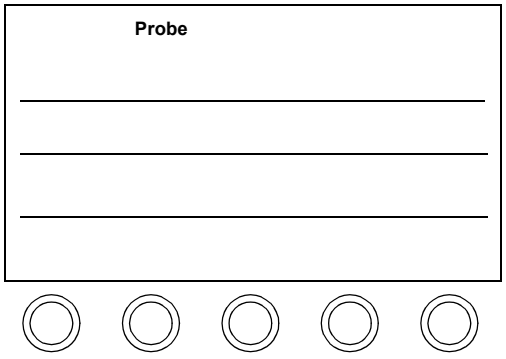
In Harmonic Fusion imaging, the Harmonic Fusion icon replaces the Frequency Fusion icon. The selection is indicated by a circle around the setting. For more information, see “Icons” on page 7-10.

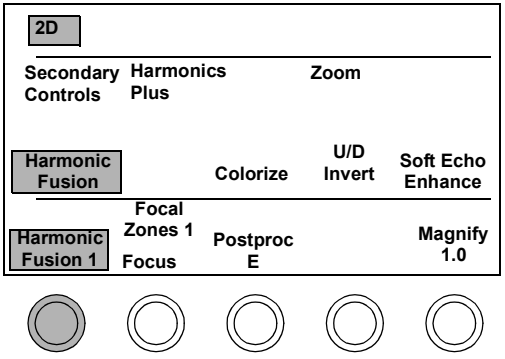
NOTE

For information about Harmonic Fusion in Live-3D and BiPlane imaging modes, see the *Using 3-Dimensional and BiPlane Imaging Guide*.

Screen and Touch Panels

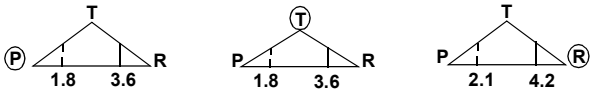






Icons

In Harmonic Fusion imaging using an s4 transducer, one of the following icons appears and replaces the Frequency Fusion icon:

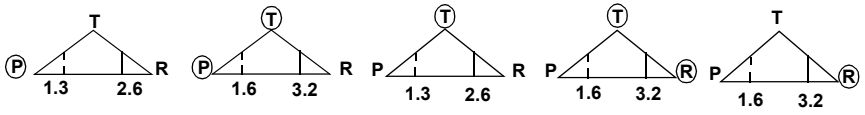


1.8, 2.1 = Transducer transmit frequency in megahertz (MHz)

3.6, 4.2 = Transducer receive frequency in megahertz

The Harmonic Fusion icon on the left shows penetration selected, as indicated by a circled P, and shows a transducer transmitting at 1.8 MHz and receiving at 3.6 MHz. The Harmonic Fusion icon in the center shows texture selected, as indicated by a circled T, and shows a transducer transmitting at 1.8 MHz and receiving at 3.6 MHz.The Harmonic Fusion icon on the right shows resolution selected, as indicated by a circled R, and shows a transducer transmitting at 2.1 MHz and receiving at 4.2 MHz.

In Harmonic Fusion imaging using an s3 probe, one of the following icons appears and replaces the Frequency Fusion icon:



1.3, 1.6 = Transducer transmit frequency in megahertz (MHz)

2.6, 3.2 = Transducer receive frequency in MHz

The Harmonic Fusion icon on the far left shows penetration selected, as indicated by a circled P, and shows the transducer transmitting at 1.3 MHz and receiving at 2.6 MHz. The Harmonic Fusion icon on the far right shows resolution selected, as indicated by a circled R, and shows the transducer transmitting at 1.6 MHz and receiving at 3.2 MHz. The Harmonic Fusion setting in the center shows texture selected, as indicated by a circled T, and shows the transducer transmitting at 1.3 MHz and receiving at 2.6 MHz. The other two intermediate Harmonic Fusion settings show a mixture of penetration and texture, or texture and resolution. The icons show circled P and T, or T and R.

NOTE

The Harmonic Fusion rotary control is not displayed when in Tissue Doppler mode.

For a complete list of transducers that are used in harmonic imaging, see the *Transducer Reference.*

Controls

Primary

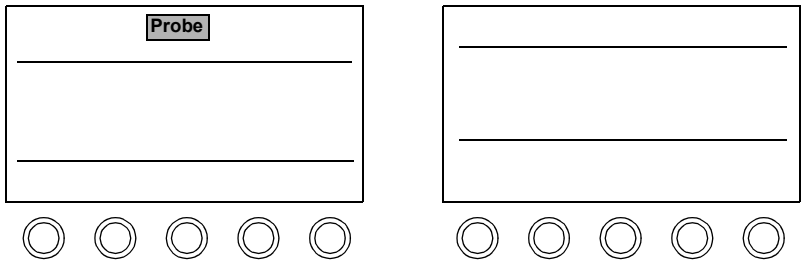
Harmonic Fusion (Touch Control)	Activates Harmonic Fusion for imaging tissue. Activates Harmonics for a 2D image only. Available only with a harmonics-ready transducer, such as the s3, s4, s8, 11-3L, c3540, OmniPlane III, or x4.
Harmonic Fusion (Rotary Control)	Selects the Harmonic Fusion setting and is available only when **Harmonic Fusion** is on. Changes are reflected in the Harmonic Fusion icon and on the process line displayed at the top left corner of the screen. Not available when the image has been frozen using the Freeze key.
Harmonics Plus	Provides enhanced Harmonics when the s3 transducer is in Harmonic Fusion settings 1, 3, and 4. May reduce the display frame rate.

Secondary

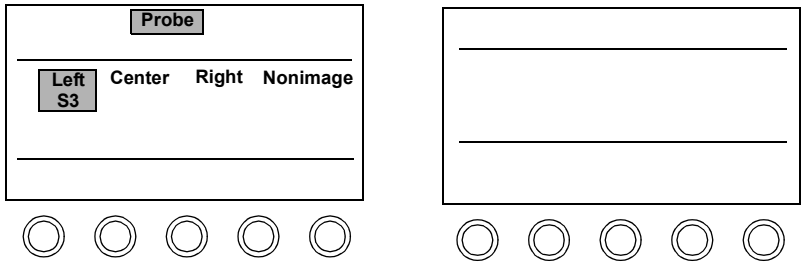
L/R Invert	Switches the left/right orientation of the image. Appears on the right primary touch panel in noncardiac presets. Also appears on the left touch panel under the Image controls.
Persist	Adjusts the amount of frame averaging, which can give a smoother appearance.
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.

Using Harmonic Fusion

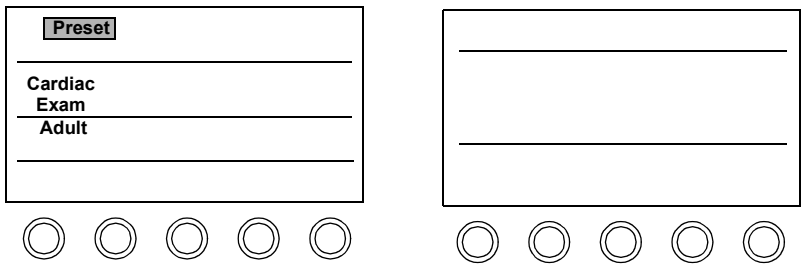
1. Touch **Probe**.



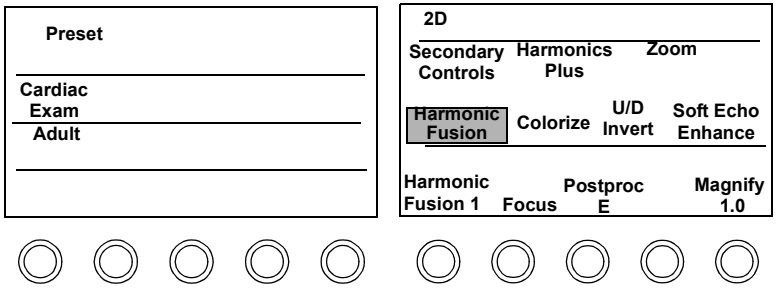
2. Touch the control indicating where the harmonics-ready transducer is connected.



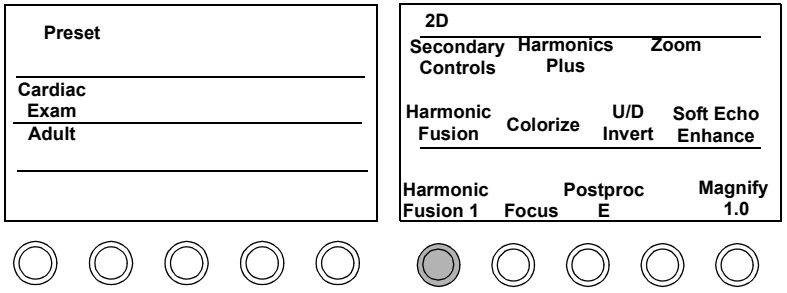
3. Touch **Preset** and select an exam type.



4. Touch **Harmonic Fusion** to activate Harmonic Fusion imaging.



5. Turn the **Harmonic Fusion** rotary control to optimize the image.



Zoom Mode

Introduction

Zoom mode allows you to magnify the image without resizing it. Zoom mode has the following features:

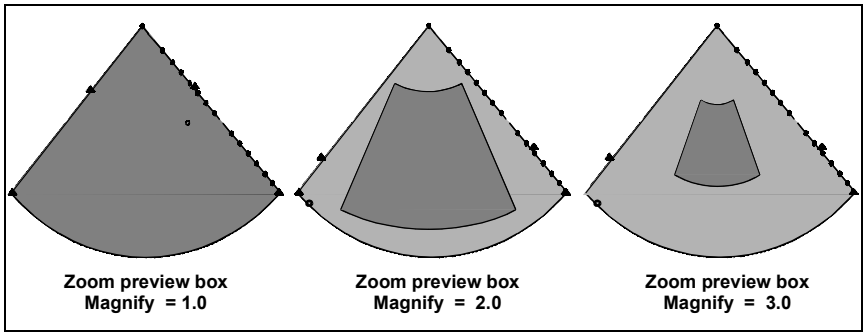
- **Zoom** is also available from a frozen nonzoomed image and during loop replay.
- A magnification rotary control allows you to quickly magnify the image without resizing. The 1.0 selection on the **Magnify** rotary control sets the image to its normal, unzoomed size.
- A zoomed image is live during repositioning.
- A **Pan** touch control in Color mode allows you to pan a color image. When the **Pan** control is on, **Position** and **Size** affect the zoom area rather than the color area.
- **Zoom** is available in Doppler and Dual image modes.

NOTE

For information about Live-3D and BiPlane Zoom mode, see the *Using 3-Dimensional and BiPlane Imaging Guide*.

Screen and Touch Panels

The following illustration shows how the Zoom preview box changes on the imaging screen as the **Magnify** rotary-control setting is increased.

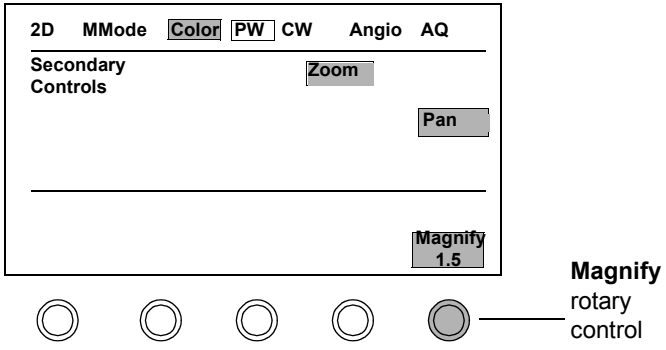


NOTE

When **Magnify** = 1, the preview box covers the entire image and there is no magnification.

Controls

The following illustration shows the Zoom mode controls:



Using Zoom Mode

1. When zoom is first activated, the default Zoom area is outlined by a Zoom preview box, at a **Magnify** setting of 2.0.

2. To increase or decrease the Zoom magnification, turn the **Magnify** rotary control.

   The size of the Zoom preview box changes accordingly. For example, the size of the box decreases when **Magnify** is set to a higher number.

3. To move the zoom preview box, use the trackball (**Position** is active when you first enter zoom preview).

4. To further change the size and shape of the Zoom preview box, press **Size** and use the trackball.

5. Touch **Zoom** again to enter full zoom mode.

   Pressing the **Enter**, **Size**, or **Position** key when Zoom is in preview mode also displays the zoomed image.

6. Touch **Zoom** again to return to the original unzoomed display.

Zoom mode has the following limitations:

- You cannot zoom in on the following frozen images: triggered trapezoid, triggered color compare, interval-triggered 2D hold, dual, and multi-frame trigger.
- The **Size** and **Position** key controls are unavailable during side-by-side MMode. You need to touch **Zoom** to select a new zoom size or position.
- The **Pan** touch control is unavailable in linear PW spectral Doppler mode.
- On steered linear dual displays, when the left and right control settings differ, each image is restricted to its own half of the screen.

NOTE After a black-and-white or color image has been frozen, it can be zoomed.

Dual Imaging Mode

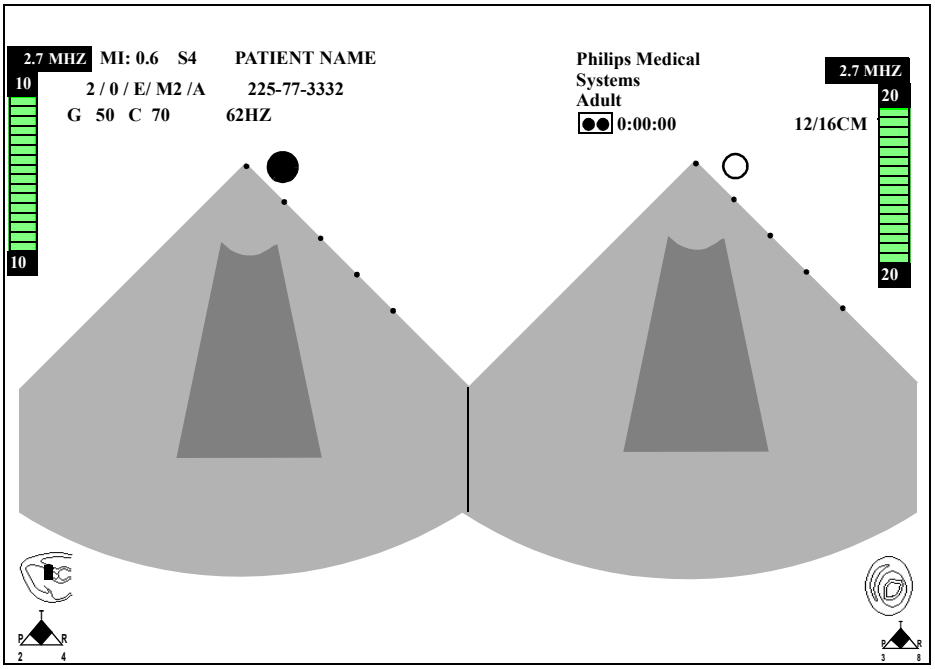
Introduction

Dual Imaging mode allows you to display and manipulate two independent scans on the SONOS imaging screen. This mode has the following features:

- Each image has its own color bar and Fusion icon.
- You can independently set the color scale.
- You can individually set and display the depth of each image at the top right of the screen. For example, 12/16 cm means that the left image is 12 cm and the right image is 16 cm.
- You can display zoomed images.
- You can select Dual Imaging mode even when an image is frozen. Turning on Dual Imaging mode after Freeze mode displays the frozen image in dual format, along with a live image. This is not available with trapezoidal images.
- You can independently select and display body markers for both images.

Screen and Touch Panels

The following illustration shows the Dual Imaging mode screen:

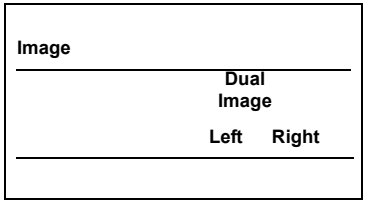


Controls

The **Left** and the **Right** touch controls allow you to select the active image. Only one image can be active at a time. The active image is identified by a clear orientation dot - ◯; the inactive image is identified by a filled dot - ●. Settings for gain and compression are abbreviated to **G** and **C**. (For example, **G 50 C 45** means that the current **Gain** setting is 50 and the **Compress** is 45.) To scroll the active image, press Freeze and scroll with the trackball.

Using Dual Imaging Mode

1. Touch **Image** on the left touch panel.



2. Touch **Dual Image**.
3. Touch **Left** or **Right** to choose the image you want to be live. A highlighted **Left** or **Right** control and a clear orientation dot on the screen indicate a live image.
4. Adjust imaging controls for the live image. The effects are seen on the live image, leaving the frozen image unchanged.
5. Press Freeze to freeze both images simultaneously. Pressing Freeze again returns the system to live imaging mode.
6. Touch **Dual Image** to exit Dual Imaging mode.

Dual Imaging mode restrictions

Dual Imaging mode is not available in MMode, AQ, or Doppler modes. You cannot change the preset while in Dual Imaging mode. You cannot display an Angio image next to a color image. You cannot adjust the

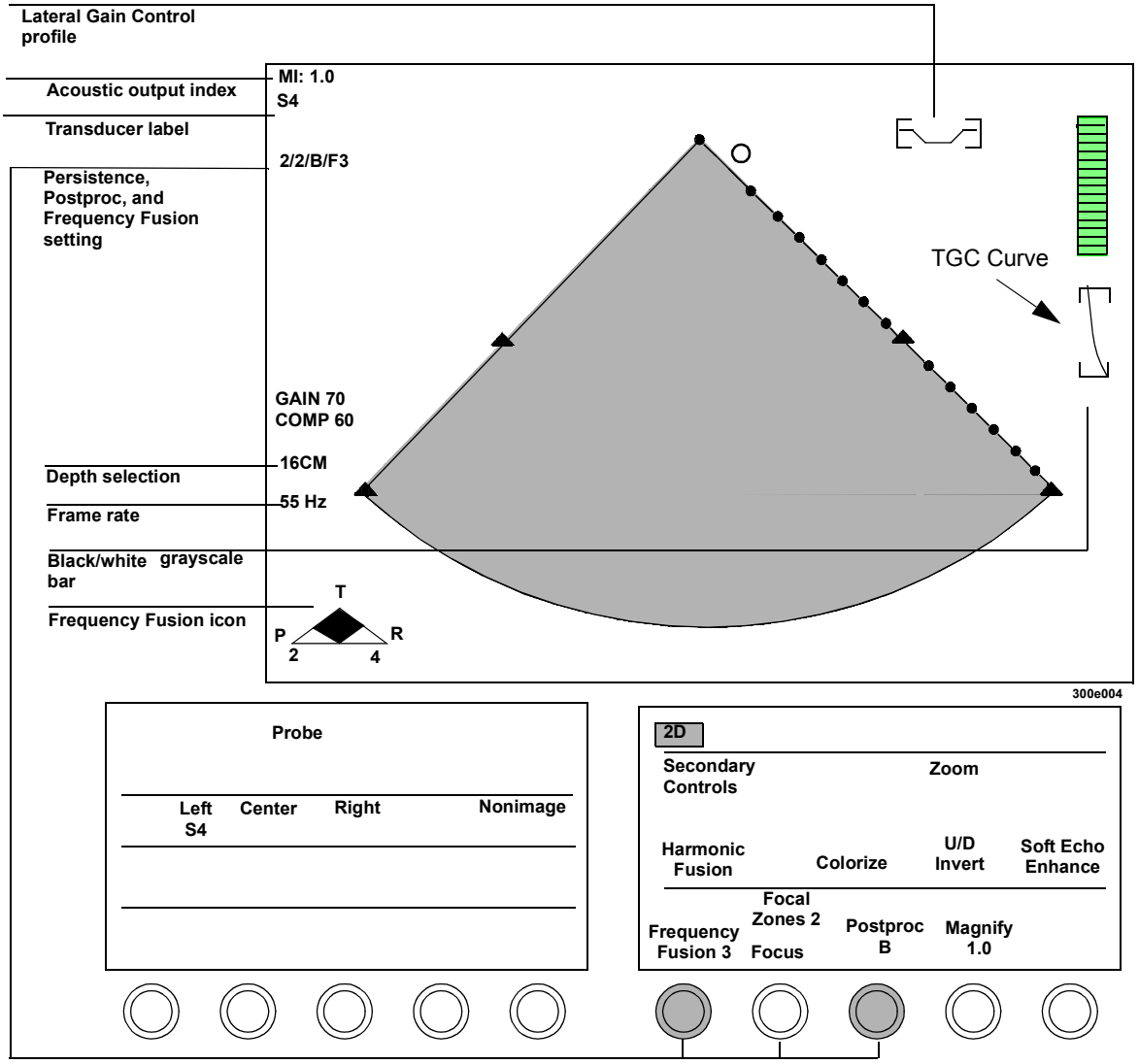
- Color baseline
- Angio threshold
- Color tag

2D Imaging

Introduction

When any transducer other than a Doppler-only transducer is being used in a cardiac preset, the default imaging modality is 2D mode. In this mode, the imaging screen displays a two-dimensional black-and-white scan.

Screen and Touch Panels



Controls

Primary

Colorize	Optimizes contrast resolution by activating the current colorization map, and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Focal Zones	Selects transmit focal zones for sector transducers. The preset and the transducer determine the available number of focal zones. A caret appears on the screen for each selected focal zone. With two focal zones active, the frame rate decreases.
Focus	Repositions the acoustic depth of the 2D focal zone, indicated by carets.
Frequency Fusion	Optimizes frequencies for penetration, texture, or resolution. Changes are reflected in the Frequency Fusion icon and on the process line displayed at the top left corner of the screen in Cardiac presets.
Frame Lock	Locks or unlocks the Integrated Backscatter (IBS) imaging frame rate to the video frame rate. The values are on and off. It is on by default. Applies to IBS, 2D, and AD.
IPower	Sets the transmit power for Contrast TCE-3 Impulse Imaging.
Harmonic Fusion (Touch Control)	Activates Harmonic Fusion for imaging tissue. Activates Harmonics for the 2D image only. Available only with a harmonics-ready transducer, such as the s3, s4, s8, 11-3L, c3540, OmniPlane III, or x4. Not available when the image has been frozen using the Freeze key.

Harmonic Fusion (Rotary Control)	Selects the Harmonic Fusion setting when Harmonic Fusion is on. Changes are reflected in the Harmonic Fusion icon and on the process line displayed at the top left corner of the screen in Cardiac presets. Not available when the image has been frozen using the Freeze key.
Harmonics Plus	Boosts BMode image sensitivity and provides enhanced Harmonics when the s3 transducer is in Harmonic Fusion settings 1, 3, and 4. May reduce the display frame rate.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
LGCs (Lateral Gain Controls)	Each of the eight sliders adjusts the amplification of returning signals within a specific lateral 2D/BMode image area. Available only with sector and curvilinear array transducers.
Postproc	Affects the softness and brightness of grayscale images stored in memory, according to visual preference. The curve you select affects both real-time and frozen images, but does not affect video playback images.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary touch controls are active.
Soft Echo Enhance (Touch Control)	Activates soft echo enhancement imaging, which may enhance visualization of low-level ultrasound signals from normal anatomy and pathology. The Soft Echo Enhance icon reflects the soft echo enhancement setting and the transducer frequency range. Frequency Fusion and Harmonic Fusion are unavailable when **Soft Echo Enhance** is on.
Soft Echo Enhance (Rotary Control)	Select the soft echo enhancement setting when **Soft Echo Enhance** is on. Settings A to C automatically adjust transmit power, persistence, dynamic range, and post-processing to provide increased sensitivity.

TGC Curve

Turns the TGC Curve display on or off. Press **Setup** and touch **TGC Curve**. Then press **Setup** again to return to the live display. TGC sliders affect the screen display only in 2D and Tissue Doppler modes.

Trapezoid

Activates trapezoidal imaging, which widens the linear image to a trapezoidal shape. Available only with transducers that offer this feature.

U/D Invert

Inverts the apex of the sector from its current orientation. Appears on the right primary touch panel in cardiac presets and on the secondary touch panel in noncardiac presets. Also appears on the left touch panel under the **Image** controls. Available only with sector and curvilinear array transducers.

Zoom

Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (**Position** is active when you first enter zoom preview). To resize the zoom preview area, press **Size** and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Secondary

Adaptive Power	Activates 2D imaging with Adaptive Power. Automatically adjusts the transmit power as focus is adjusted. When **Adaptive Power** is on, moving the focal carat to the near field reduces clutter. When multiple focal zones are active, the power adapts to the deepest focal carat. Available in Fusion imaging, but not in Harmonic, Contrast, or Soft Echo Enhancement imaging. This control is unavailable with curvilinear transducers.
IBS	Toggles between an Integrated Backscatter (IBS) image and a standard 2D image. Mainly used for Tissue Characterization studies using Acoustic Densitometry (AD). Values are on and off. By default, it is off.
LGC	Turns the Lateral Gain Controls on and off.
L/R Invert	Switches the left/right orientation of the image. Appears on the secondary touch panel in cardiac presets and on the right primary touch panel in noncardiac presets. Also appears on the left primary touch panel under the **Image** controls.
Sweep	Changes the sweep speed of the ECG waveform. Available speeds are 25, 50, 100, and 150 mm/sec.
Persist	Adjusts the amount of frame averaging, which can give a smoother appearance.
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power. This control is displayed as part of the primary 2D control set when **Contrast** is on.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.

Setup

Acquire Max:120/300Hz	Works in conjunction with the **Maximize Transfer/ Frames** touch control in **Disk Setup**. **Acquire Max:120 Hz** limits frame rate to 120 Hz. **Acquire Max:300 Hz** allows frame rates up to 300 Hz.
Depth Marks	Displays fixed depth marks along the right side of the image. The MMode/Doppler line is displayed only if **MMode** or **Doppler** is on while depth marks are displayed.
Time Gain Compensation (TGC) sliders	Adjusts amplification of returning 2D signals at a specific image depth. Moving the slider to the right increases amplification; moving the slider to the left decreases amplification. Screen display of slider settings is toggled on and off using the **TGC Curve** 2D Setup control.

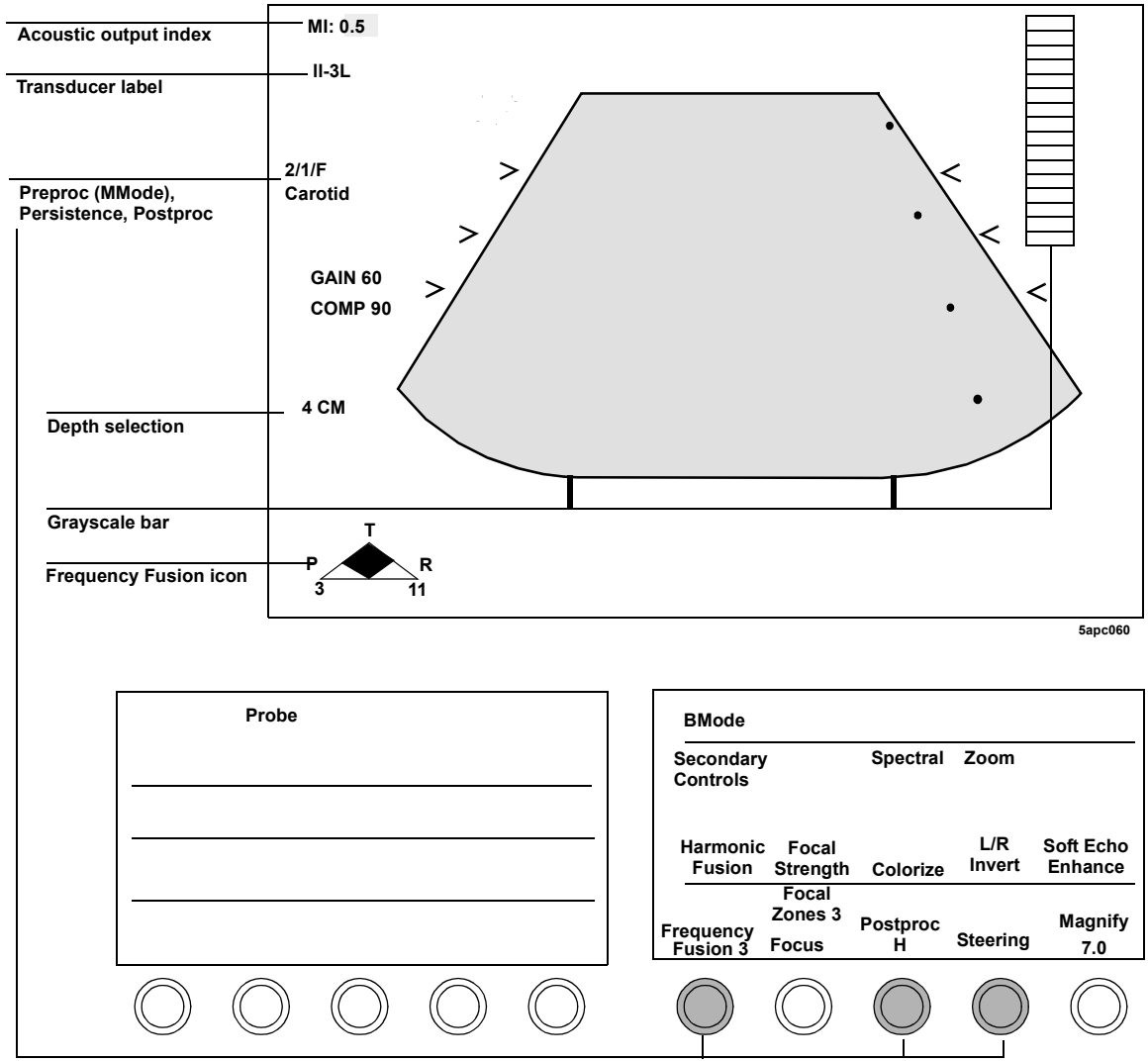
2D/BMode Imaging

Introduction

When any transducer other than a Doppler-only transducer is being used in a noncardiac preset, the default imaging modality is 2D/BMode. In this mode, the imaging screen displays a two-dimensional black-and-white scan.

NOTE 2D/BMode is available in noncardiac presets.

Screen and Touch Panels



Controls

Primary

BMode is used for all presets except cardiac.

Colorize	Optimizes contrast resolution by activating the current colorization map and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Focal Strength	When on, the focus is increased at the selected focal zone or zones, producing better resolution in the area of interest. If more that one focal zone is selected, the focal carets are automatically positioned closer together on the screen, indicating the increased focal intensity. (**Focal Strength** is only available on linear and CLA transducers.)
Focal Zones	Selects up to four possible transmit focal zones. The actual number of zones available is dependent on transducer and depth. A caret appears on the screen for each selected focal zone. As focal zones are increased, the frame rate decreases.
Focus	Repositions the acoustic depth of the 2D/BMode focal zone, indicated by carets.
Frequency Fusion	Optimizes frequencies for penetration, texture, or resolution. Changes are reflected in the Frequency Fusion icon.
Harmonic Fusion (Touch Control)	Activates Harmonic Fusion for imaging tissue. Activates Harmonics for a 2D image only. Available only with a harmonics-ready transducer, such as the s3, s4, s8, 11-3L, c3540, OmniPlane III, or x4.
Harmonic Fusion (Rotary Control)	Selects the Harmonic Fusion setting when **Harmonic Fusion** is on. Changes are reflected in the Harmonic Fusion icon.

LGCs	(Lateral Gain Controls) Each of the eight sliders adjusts the amplification of returning signals within a specific lateral 2D/BMode or AQ image area. Available only with sector and curvilinear array transducers.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Postproc	Affects the contrast and brightness of grayscale images stored in memory, according to visual preference. The curve you select affects both real-time and frozen images, but does not affect video playback images.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Soft Echo Enhance (Touch Control)	Activates soft echo enhancement imaging, which may enhance visualization of low-level ultrasound signals from normal anatomy and pathology. The Soft Echo Enhance icon replaces the Frequency Fusion icon and reflects the setting and the transducer frequency range. Frequency Fusion and Harmonic Fusion are unavailable when **Soft Echo Enhance** is on.
Soft Echo Enhance (Rotary Control)	Select the soft echo enhancement setting when **Soft Echo Enhance** is on. Settings A to C automatically adjust transmit power, persistence, dynamic range, and post-processing to provide increased sensitivity.
Spectral	Reformats the screen display to turn a Doppler spectral trace on or off.
Steering	Enables continuous steering of linear grayscale images to the right or left, to achieve an optimum imaging angle.
Zoom	Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (**Position** is active when you first enter zoom preview). To resize the zoom preview area, press **Size** and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Secondary

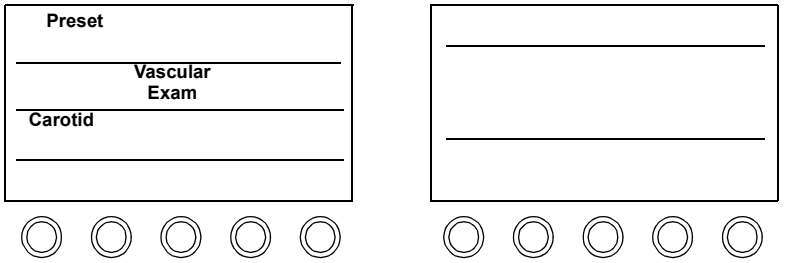
Adaptive Power	Activates 2D imaging with Adaptive Power. Automatically adjusts transmit power as focus is adjusted. When Adaptive Power is on, moving the focal carat to the near field reduces clutter. When multiple focal zones are active, the power adapts to the deepest focal carat. This control is unavailable with Curvilinear transducers.
Depth Marks	Displays fixed depth marks along the right side of the image. The MMode/Doppler line is displayed only if MMode or Doppler is on while depth marks are displayed.
Edge Enhance	Provides increased edge definition in the PW image and the MMode trace by using the touch controls.
LGC	Turns the Lateral Gain Controls on and off.
Persist	Adjusts the amount of frame averaging, which can give a smoother appearance.
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power. Is displayed as part of the primary 2D control set when contrast is on.
Trapezoid	Activates trapezoidal imaging, which widens the linear image to a trapezoidal shape. Available with linear array transducers.
U/D Invert	Inverts the apex of the sector from its current orientation. Appears on the right primary touch panel in cardiac presets and on the secondary touch panel in noncardiac presets. Also appears on the left touch panel under the **Image** controls. Available only with a sector and curvilinear array transducers.

Setup

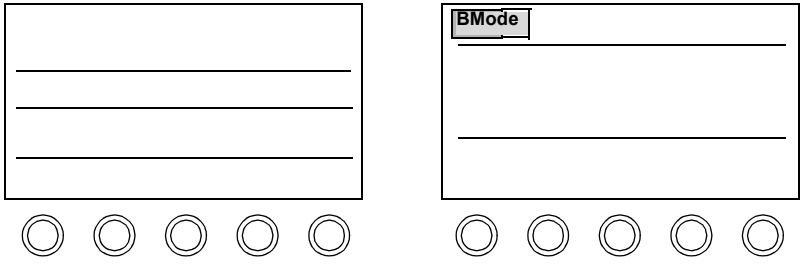
Acquire Max:120/300Hz	Works in conjunction with the **Maximize Transfer/ Frames** touch control in **Disk Setup**. **Acquire Max: 120 Hz** limits frame rate to 120 Hz. **Acquire Max: 300 Hz** allows frame rate to 300 Hz.

Using 2D/BMode

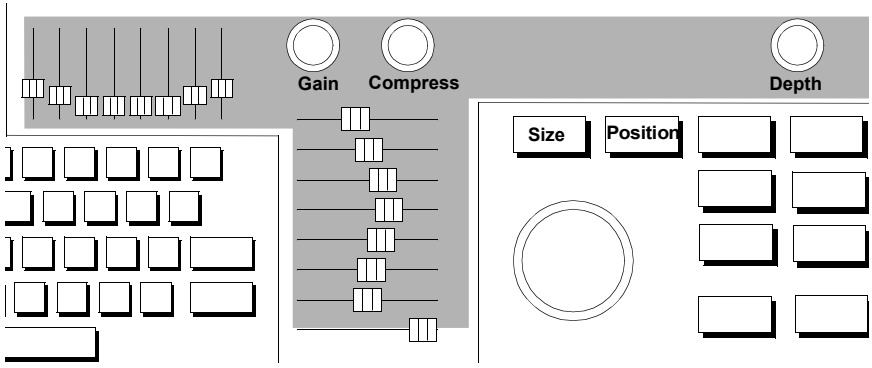
1. Ensure the active preset is correct for the study. To change a preset, touch **Preset** and choose the exam type (if applicable) and the preset.



2. Touch **BMode.**



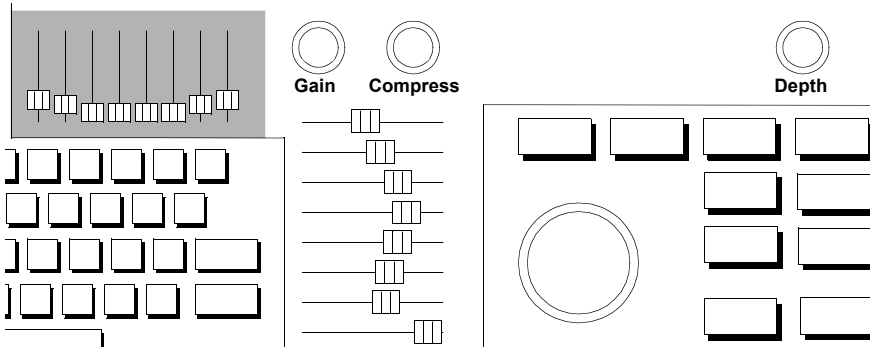
3. Adjust the imaging controls sliders, as necessary. You may also need to increase the **Power** settings to increase the acoustic power and adjust the TGC and Gain settings.



Tip: Narrowing the image width increases the frame rate.

4. Optimize the image using the touch controls. To adjust the image location or width, press **Size** or **Position** and use the trackball.

5. To see lateral walls more clearly, adjust the LGC sliders.



Displaying a time gain compensation (TGC) curve

To display a TGC curve:

1. In 2D or BMode, press Setup.
2. Touch **TGC Curve** on the right touch panel.
3. Press Setup to exit.

Biopsy Support

Introduction

Your system supports the use of biopsy needle guides on these probes:

- E6509
- c3540
- C5040

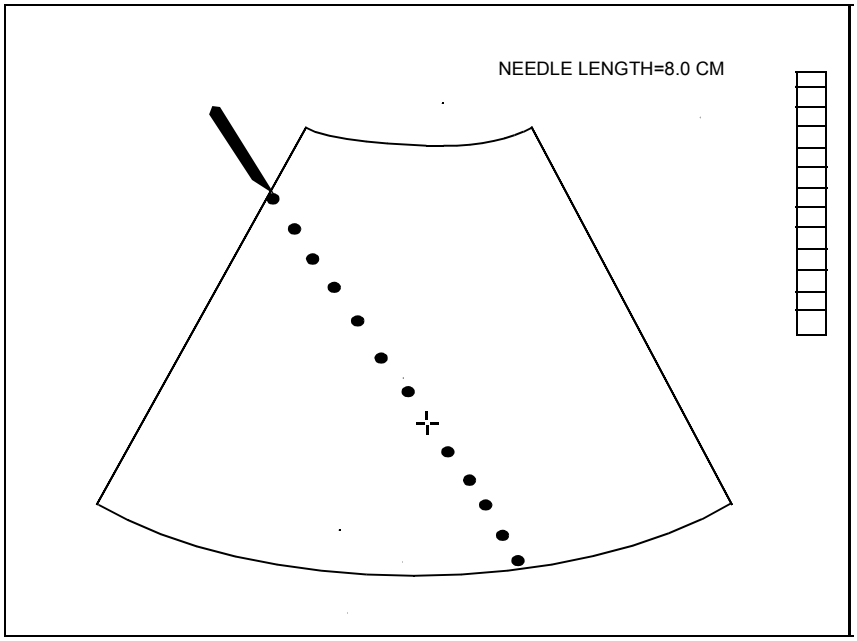
Biopsy support is available when

- A probe (for which biopsy needle guides are available) is connected to the system and selected
- A noncardiac preset is selected
- Zoom mode is off

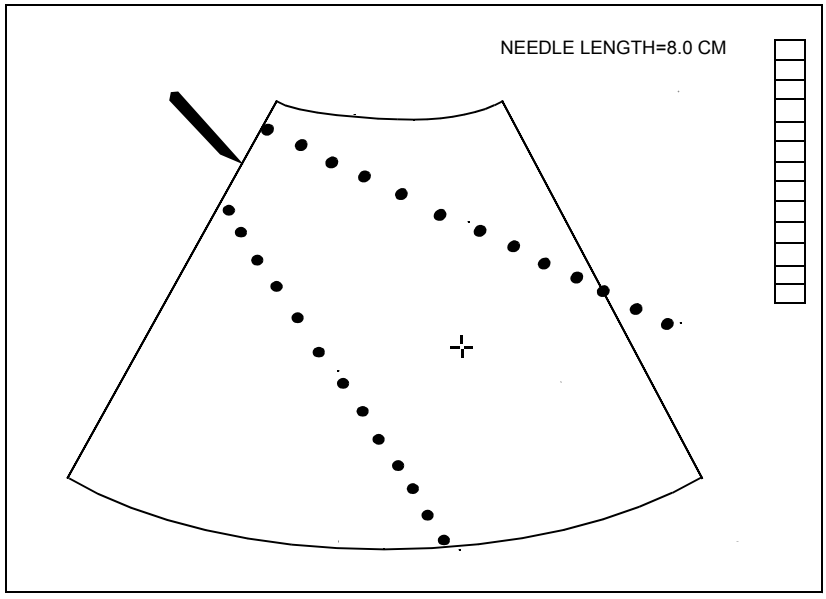
Biopsy screens

The following illustration shows the biopsy gun graphic. It indicates the ideal biopsy needle path as a dotted line at an angle to the image. When the needle can be mounted in more than one position, the **Crossover Depth** rotary control selects the angle. The spacing along the needle path is 1 cm for deep depths and 0.5 cm for shallow depths.

A crosshair cursor on the dotted line indicates the target. The trackball controls the cursor location. In the upper right corner of the screen display, **NEEDLE LENGTH** indicates the minimum length of needle required to reach the target. This is the distance from the top of the needle guide to the target.



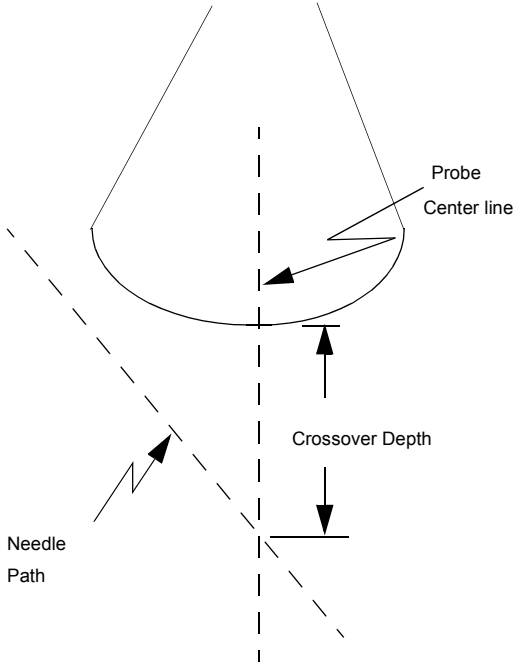
The following illustration shows the biopsy needle graphic. The diverging dotted lines show the area in which the needle can be expected to travel. These display guidelines should be used as an indicator only. Needle deflection or bending may occur as it passes through tissue. Use the imaging screen to monitor the progress of the needle. The spacing is 1 cm along the needle path for deep depths and 0.5 cm for shallow depths.



The dotted lines are set at an angle to the image. When the needle can be mounted in more than one position, the **Crossover Depth** rotary control selects the display appropriate for the needle position. The display changes to show the angle corresponding to the selected position. A crosshair cursor between the dotted lines indicates the target. The trackball controls the cursor location on the ideal needle path. In the upper right corner of the screen, **NEEDLE LENGTH** indicates the minimum length of needle required to reach the target. This is the distance from the top of the needle guide to the target.

CAUTION The onscreen guidelines are intended as guides only and should never be used as absolute references.

The following illustration shows an example of the crossover depth. Biopsy needles mount on probes at an angle to the probe center line. Some biopsy guides, for example the C5040, can support more than one needle position. Each needle position on the guide is marked with its crossover depth. Crossover depth is the distance from the face of the probe to the point where the needle path intersects the probe center line.



NOTE

The crossover depth is an estimate and does not replace more direct measurements. Use the crossover depth only to identify the needle position on the guide and to select the correct crossover depth control setting.

Controls

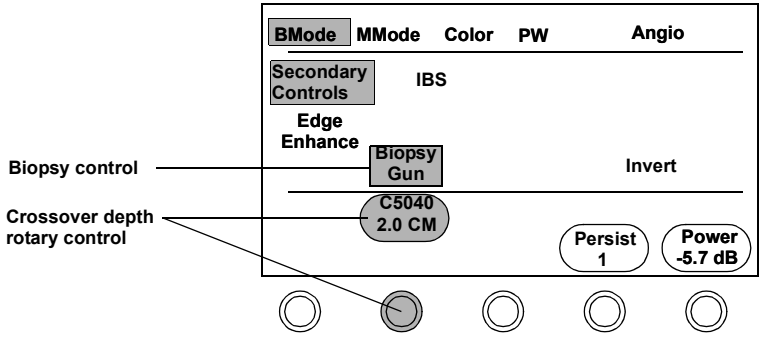
The SONOS biopsy controls and displays help direct the operation of the biopsy needle.

CAUTION During biopsy operations, it is important that you activate onscreen biopsy guidelines and carefully watch the image during needle insertion, to verify the needle path.

To use the biopsy controls, you need a biopsy-enabled transducer. The biopsy support controls are located on the right touch panel by touching **BMode** and **Secondary Controls**:

A touch control with three options lets you select the following:

- **Biopsy Off**—Disables the biopsy controls.
- **Biopsy Gun**—Displays a single dotted line representing the ideal needle path. (See page 7-40.)
- **Biopsy Needle**—Displays diverging dotted lines representing the expected path of the needle during insertion. (See page 7-41.)



Following are some guidelines for using SONOS biopsy controls:

- If the selected probe supports multiple needle mounting positions, you can use a rotary control to select crossover depth. (See page 7-42.)
- Biopsy graphics are erased from the screen in cardiac presets, and in PW, CW, MMode, and zoom modes.
- Changing the probe selection turns off biopsy support; it can be reactivated only when a probe that accepts biopsy guides is selected.
- When a biopsy screen display is on, the trackball controls a marker indicating the position on the image that is the target of the biopsy procedure along the needle path. The minimum needle length required to reach the target marker is displayed in the upper right corner of the screen.

Probes supporting biopsy

The following probes accept biopsy needle guides.

Probe	Model	CIVCO Biopsy Kit	Crossover Depths
E6509	21336A	610-588	187 mm
c3540	21321A	645-057	90 mm
C5040	21373A	645-032	20 mm 50 mm

To order biopsy kits contact
CIVCO Medical Instruments Co.
102 First Street
Kalona, IA 52247-9589 U.S.A.

E-mail: info@civcomedical.com
www.civco.com
Phone inside US: (800) 445-6741
Phone outside US: 1-319-656-4447
Fax orders to: 1-319-656-4451

For information about ordering other Philips Medical Systems supplies and accessories, see “Supplies and Accessories” on page 1-17.

NOTE

See the *Transducer Reference* for safety and maintenance information about the use of biopsy needles and guides.

2D/BMode Troubleshooting

Always make sure the transducer and active preset are appropriate for the study being performed. If necessary, adjust the and monitor controls for ambient light. After adjusting any control, always check the transducer position.

Symptom	Suggestion
Image is difficult to see.	Adjust the screen's background using the **Backgrnd** control (a System Setup touch control) Adjust the position of the monitor. **Gain**. Adjust TGC settings. **Compress**. Use the lower Frequency Fusion setting. Otherwise, change to a lower frequency transducer. **Power**. Use Harmonic Fusion to reduce clutter and delineate tissue borders.
Image is too soft, hazy, or gray.	Adjust the **Postproc** rotary control to obtain the desired image appearance. **Compress** to reduce low-level echoes. **Persist** to sharpen the image. Adjust monitor settings. Turn off **Soft Echo Enhance**. Use Harmonic Fusion to reduce clutter and delineate tissue borders.

Image has too much contrast or is grainy.	**Postproc** to decrease grayscale contrast. **Compress** to increase low-level echoes. **Frequency Fusion**. Increase transmit power by moving the transmit carat downward, if **Adaptive Power** is on or if using the control on the secondary touch panel. Otherwise, change to a higher frequency transducer. For slow-moving blood or structures, touch **Secondary Controls** and **Persist** to soften the image. Adjust monitor settings. Use soft echo enhancement to emphasize certain pathologic or physiologic conditions.
Not enough penetration.	**Gain**. **Frequency Fusion**. Increase transmit power by moving the transmit carat downward (if on) on or using the control on the secondary touch panel. Otherwise, change to a lower frequency transducer. **Power**.
Grayscale images are printed on the wrong printer.	Press **Setup**, touch **Print**, and adjust **B/W [printer]** to display the printer to use for grayscale images.

Cannot see cardiac image.	Check the transducer position, and adjust if necessary. **Gain**. **Frequency Fusion**. Otherwise, change to a lower frequency transducer. Touch **Harmonic Fusion** and choose setting 1. Increase the frame rate by decreasing the width with Size and the trackball. If necessary, use **Zoom**. **Postproc** to select a higher contrast curve. Touch **Colorize** to improve contrast resolution. **Power**. Use Harmonic Fusion to reduce clutter and delineate tissue borders.
Cannot see lateral walls with sector transducers.	Adjust the LGC sliders that affect the wall area. Then adjust the sliders that affect either side of the wall area, to keep the LGC profile smooth instead of peaked. Use Harmonic Fusion to reduce clutter and delineate tissue borders.
Vessel walls are unclear.	With a linear transducer, adjust **Steering** to make the beam perpendicular to the walls. Reposition the transducer. Adjust TGCs, **Gain**, and **Compress**. Use soft echo enhancement to emphasize certain pathologic or physiologic conditions.
In soft echo enhancement mode, external radio frequency interference (RFI) affects the image.	Select **Soft Echo Enhance A** or **Soft Echo Enhance B**, instead of **Soft Echo Enhance C**.

MMode Imaging

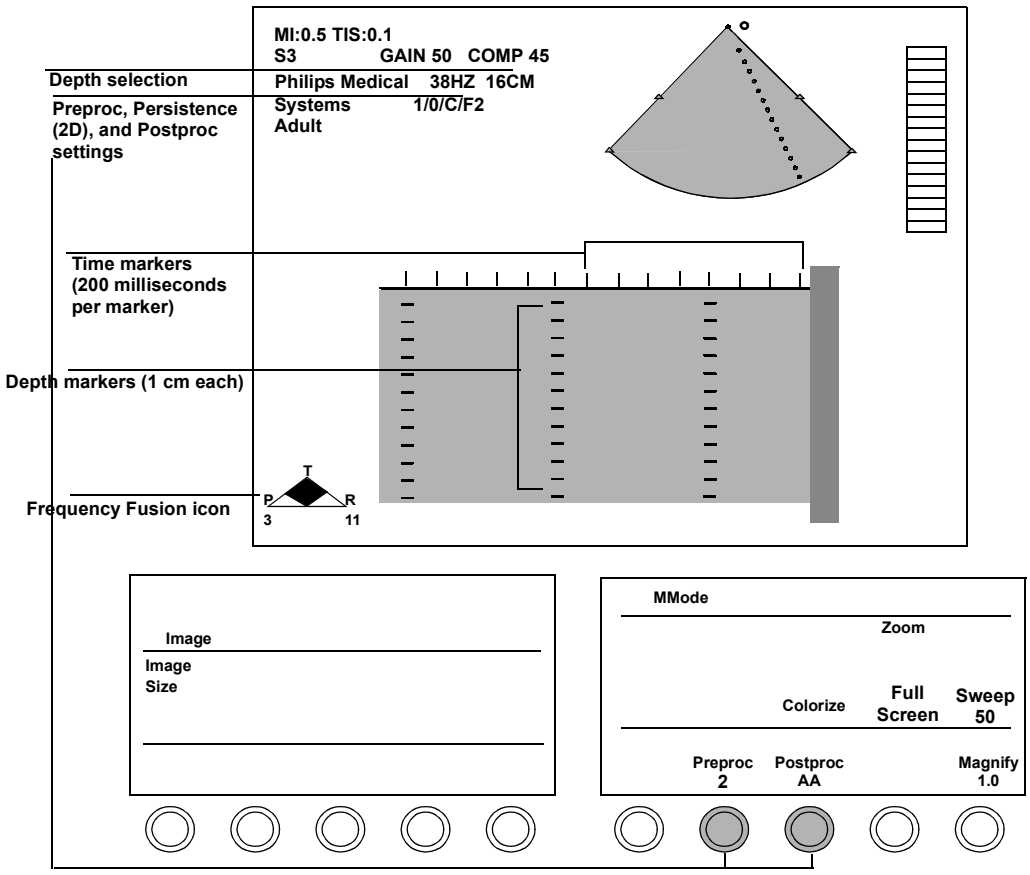
Introduction

2D/MMode is useful for timing the movement of cardiac structures. Any movement along the line of sight through the heart is translated into onscreen traces that accompany the scan image.

NOTE MMode is not available in Color mode using a linear transducer or in Angio mode.

Screen and Touch Panels

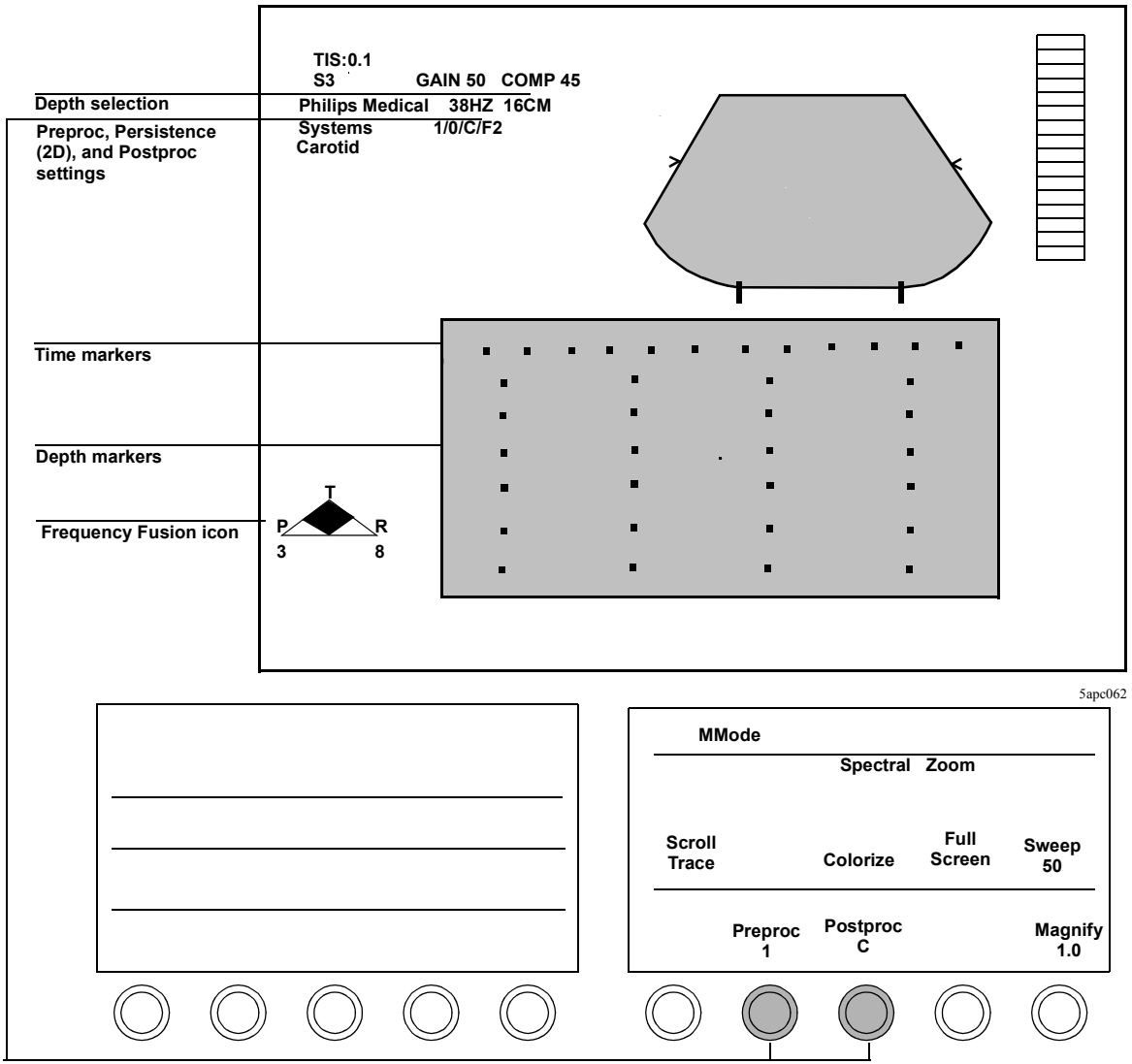
Cardiac



NOTE

The screen can display an image and trace using four different formats. For more information, see "Displaying spectral and MMode traces" on page 7-57.

Noncardiac


TIS:0.1
S3
GAIN 50 COMP 45
Philips Medical Systems
38HZ 16CM
1/0/C/F2
Carotid
Depth selection
Preproc, Persistence (2D), and Postproc settings
Time markers
Depth markers
Frequency Fusion icon
T
P
R
3
8
5apc062
MMode
Spectral
Zoom
Scroll Trace
Colorize
Full Screen
Sweep 50
Preproc 1
Postproc C
Magnify 1.0

Controls

Cardiac

If **Color** is active when you enter MMode, a subset of the Color controls appear instead of the MMode controls shown here.

Colorize	Optimizes contrast resolution by activating the current colorization map, and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Full Screen	If an MMode trace is present, toggles between full size trace and the last used mode format defined by **Image Size**.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes. In MMode, this only affects the reference image.
Pan	When **Zoom** is on, enables the trackball to move the zoom/color box area over the image. **Position** must be highlighted.
Postproc	Affects the softness and brightness of MMode images stored in memory, according to visual preference. The curve you select affects both real-time and frozen images, but does not affect video playback or 2D images. May be adjusted after freezing the image.
Preproc	Adjusts the amount of contrast before MMode images are stored in memory.
Print	Produces a hard copy of the screen display. If the onscreen image is live, it briefly freezes during printing and then returns to live imaging. You also can use the foot switch pedal to print information.
Sweep	Changes the sweep speed for MMode images and any active physios. The display recording is at the speed selected. Available speeds are 25, 50, 100, and 150 mm/sec.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Zoom Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (Position is active when you first enter zoom preview). To resize the zoom preview area, press Size and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Noncardiac

If Color mode is active when you enter MMode, Color controls appear instead of the MMode controls shown here.

NOTE You cannot use Color MMode with linear transducers.

Colorize Optimizes contrast resolution by activating the current colorization map, and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.

Full Screen If an MMode trace is present, toggles between full size trace and the last used mode format define by **Image Size** or by a preset.

Magnify Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.

Postproc Affects the softness and brightness of MMode images stored in memory, according to visual preference. The curve you select affects both real-time and frozen images, but does not affect video playback images.

Preproc Adjusts the amount of contrast.

Print Produces a hard copy of the screen display. If the onscreen image is live, it briefly freezes during printing and then returns to live imaging. You also can use the foot switch pedal to print information.

Scroll — Toggles between scrolling the trace display and the reference image. To use the Scroll Image, first press Freeze.

Spectral — Reformats the screen display to turn a Doppler spectral trace on or off.

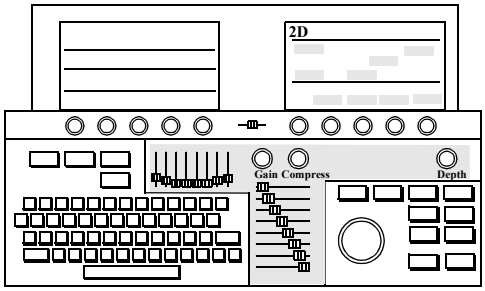
Sweep — Changes the sweep speed for MMode images. Available speeds are 25, 50, 100, and 150 mm/sec.

Zoom — Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (Position is active when you first enter zoom preview). To resize the zoom preview area, press Size and use the trackball. Then touch zoom again to enter full zoom mode.

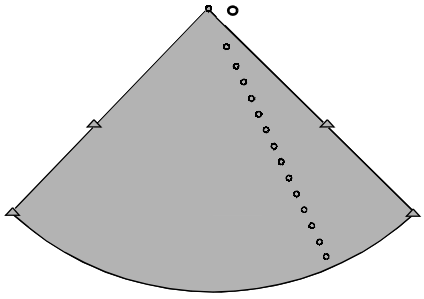
Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Using MMode

1. Optimize the 2D or BMode image. To use Color MMode, touch **Color** and optimize the image using the keyboard imaging controls. Press **Enter** to return trackball control to the cursor line.



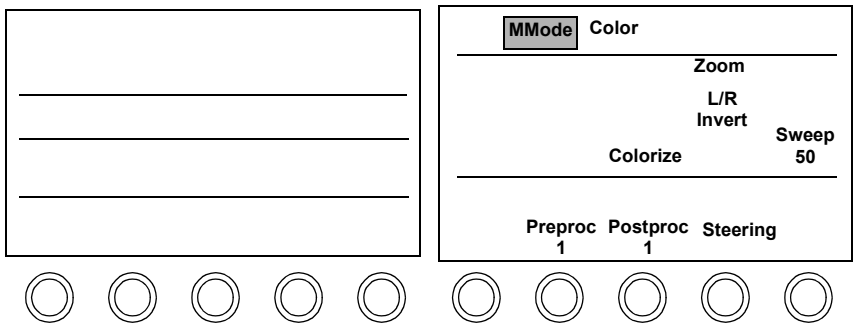
2. Position the cursor line with the trackball.



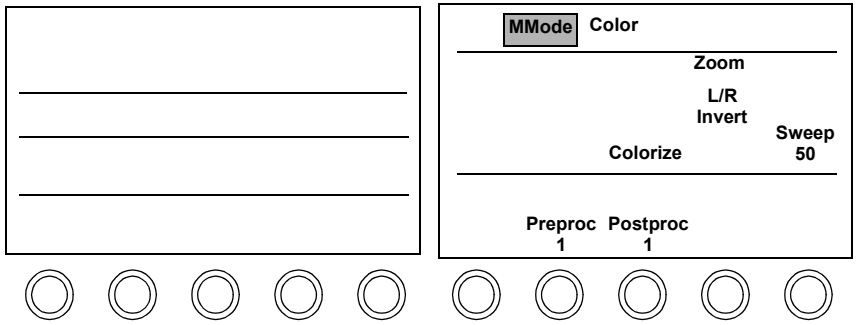
300e004a

Tip: If **Color** is on, but you do not want to see it, touch **Color Suppress**.

3. Touch **MMode**.

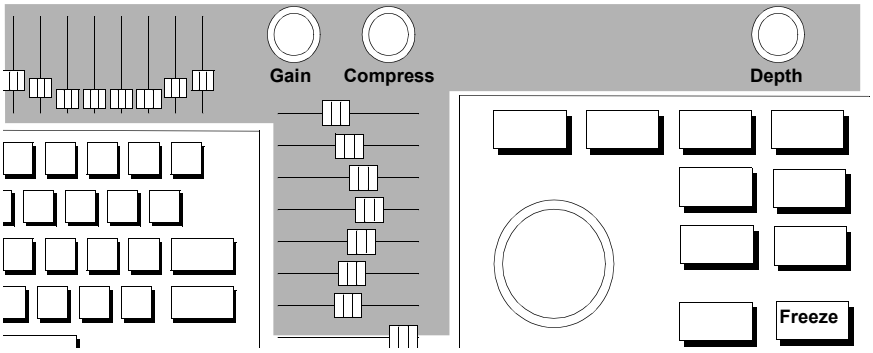


4. Optimize the display using the MMode touch controls.



Tip: Touching the **2D/BMode Gain** setting affects the MMode gain.

5. Adjust the keyboard imaging controls, as necessary. To scroll an MMode display, press **Freeze** and use the trackball. To return to live imaging, press **Freeze** again.

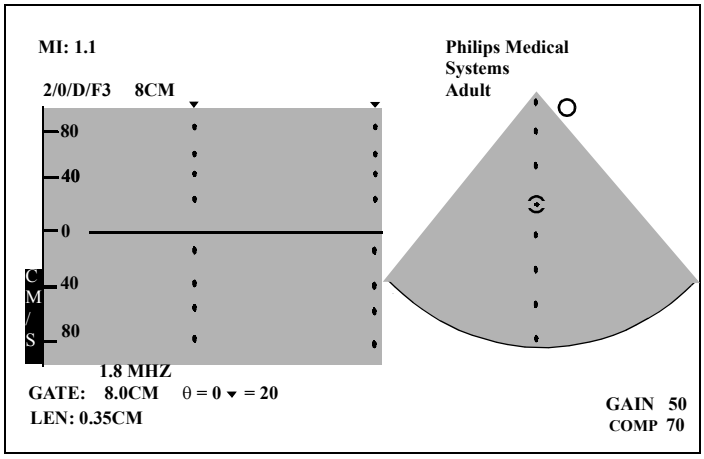


Displaying spectral and MMode traces

There are four displays for Spectral and MMode traces:

- Small image on top with large trace on bottom
- Large image on top with small trace on bottom
- Side-by-side image and trace
- Full-screen trace

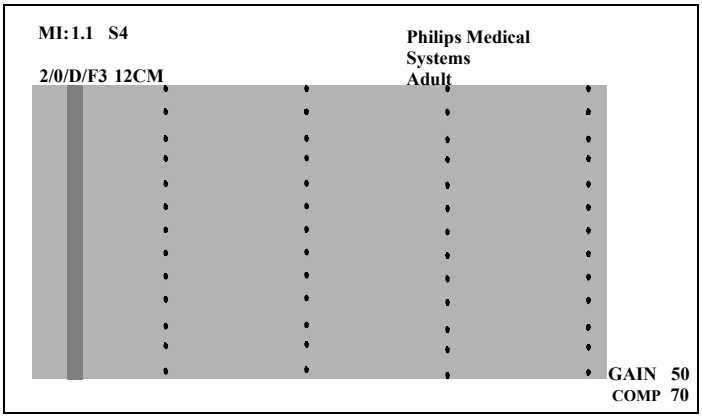
The following illustration shows the side-by-side display:



NOTE

Full-screen and side-by-side MMode are unavailable when the depth is less than 3 cm (6 cm in Color and Angio). For European (PAL), the limits are 4 cm and 7 cm.

The following figure shows the full-screen display:



Displaying side-by-side MMode or Doppler

To display the side-by-side format in MMode or Doppler

1. Touch **Image** on the left touch panel.
2. Touch **Image Size** repeatedly to cycle through the available formats until the side-by-side format appears. At shallow depths, this format is unavailable.

Changing the display to full screen

To display a full-screen MMode or Doppler trace:

1. Touch **Full Screen** on the right touch panel.
2. Touch **Full Screen** again to switch back to the previous display.

For more information on MMode and Doppler, see "Using MMode" on page 7-54 and "PW and CW Imaging" on page 7-79.

MMode Troubleshooting

Always make sure the active preset is appropriate for the study being performed. If necessary, adjust the and monitor controls for ambient light.

Symptoms	Suggestions
Trackball moves too fast or too slowly.	Move the large dot on the cursor line toward the bottom of the image, using the trackball.
Poor MMode image.	Try **Preproc 1** for a softer image, or **Preproc 2** for a crisper image. Optimize the image by adjusting **Gain**, **Compress**, and TGCs. **Postproc** in MMode to increase the contrast of grayscale images.
MMode image is too faint on the display.	**Gain**.
Trackball moves backward.	In **Setup** under the **Loop** controls, touch **Scroll** and move right or left.

Color Imaging

Introduction

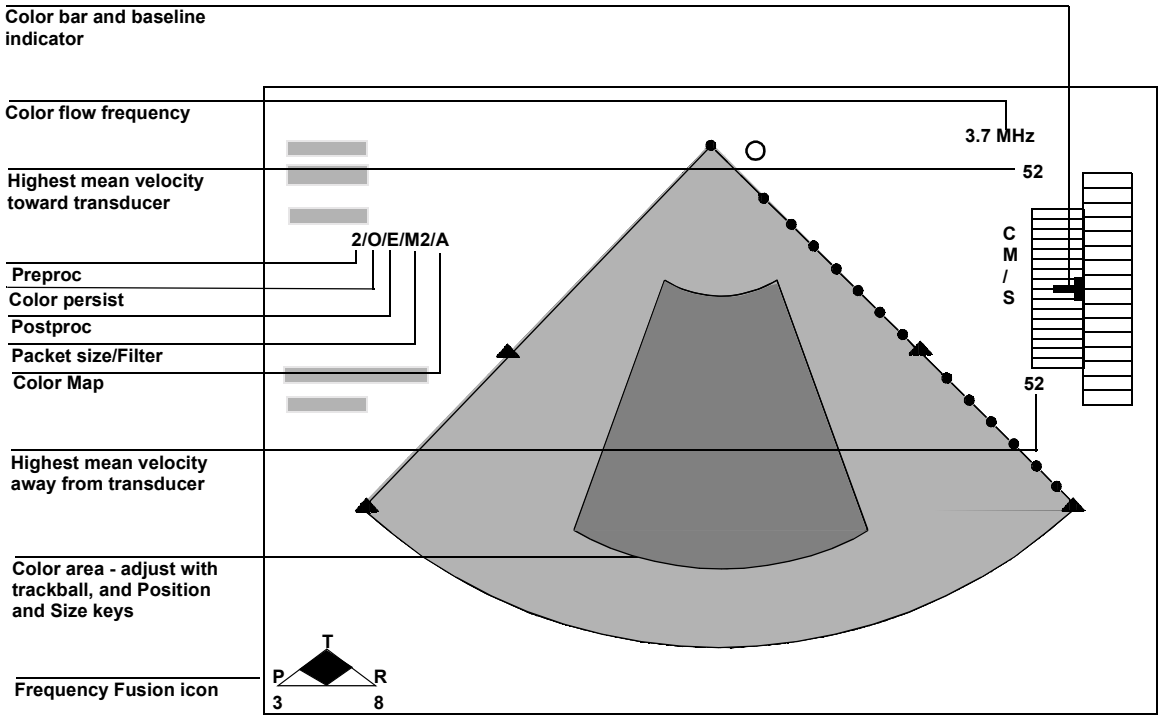
Color mode uses color to represent the mean ‘velocity and direction of either blood (Color Flow) or tissue (Tissue Doppler). Different shades of colors in a defined color spectrum represent different velocities and directions of blood or tissue movement within the selected color area.

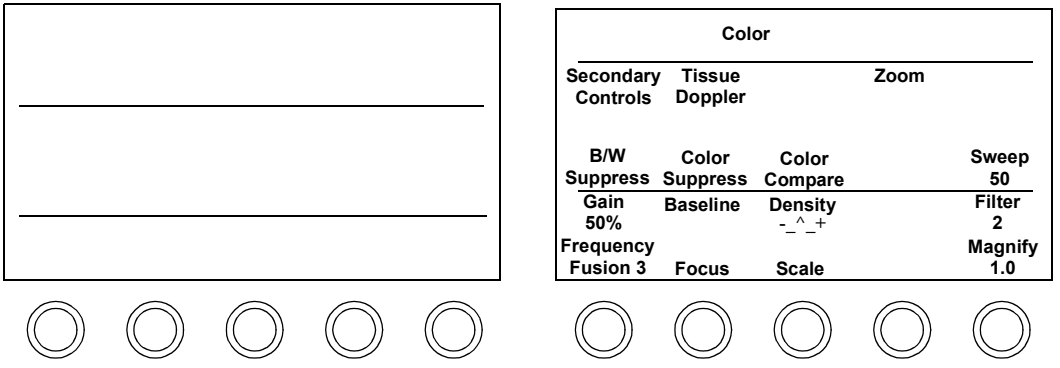
Color Flow is usually used to examine blood flow through valves or pathological orifices in the heart, or through vessels of the body. Tissue Doppler is usually used to examine tissue movement. Usually the color red represents flow or movement towards the transducer and blue represents flow or movement away from the transducer.

NOTE Color mode is not available in MMode imaging when using a linear transducer.

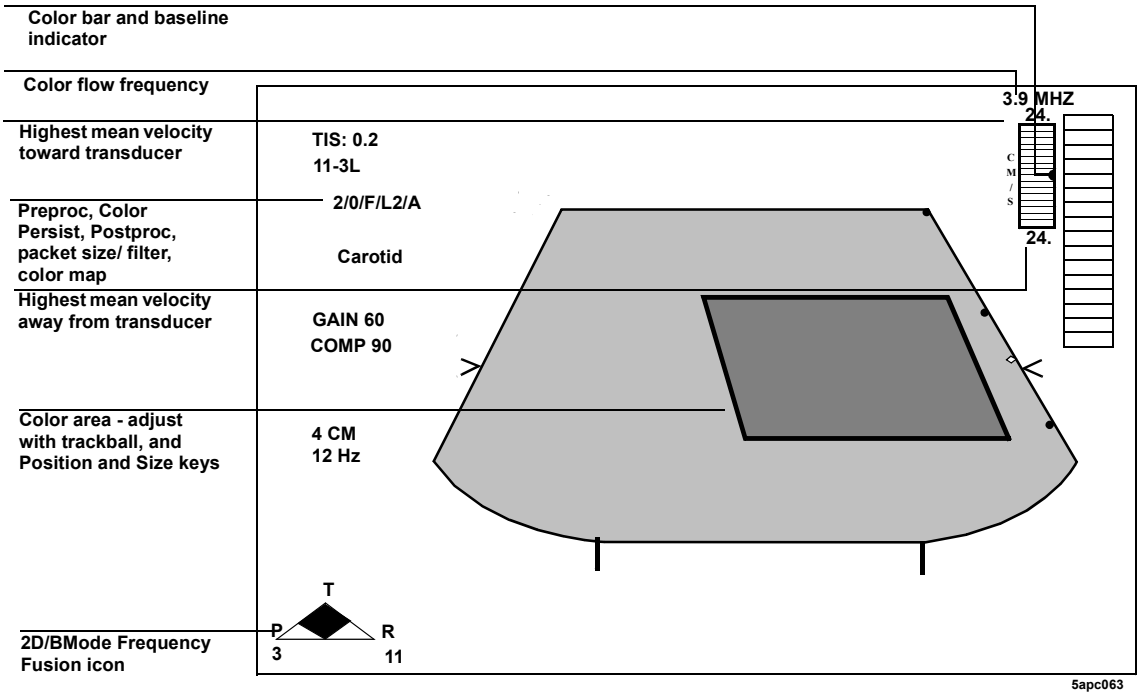
Screen and Touch Panels

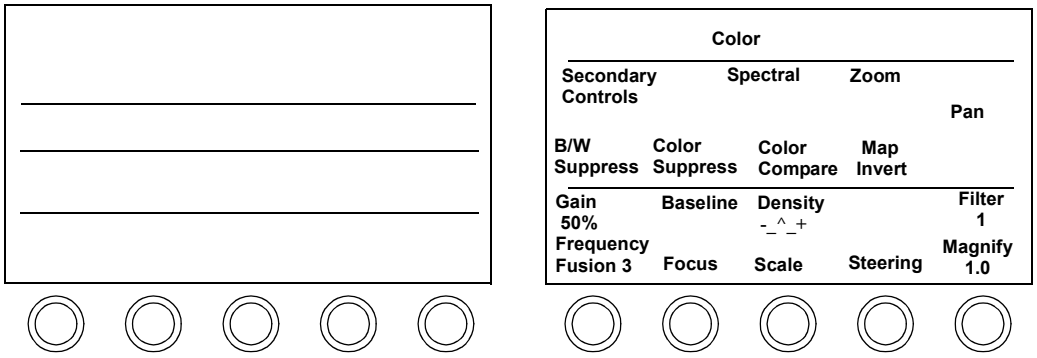
Cardiac





Noncardiac


Color bar and baseline indicator
Color flow frequency
Highest mean velocity toward transducer
Preproc, Color Persist, Postproc, packet size/ filter, color map
Highest mean velocity away from transducer
Color area - adjust with trackball, and Position and Size keys
2D/BMode Frequency Fusion icon
3.9 MHZ
24.
24.
CM/S
TIS: 0.2
11-3L
2/0/F/L2/A
Carotid
GAIN 60
COMP 90
4 CM
12 Hz
T
P
R
3
11
5apc063


Color
Secondary Controls
Spectral
Zoom
Pan
B/W Suppress
Color Suppress
Color Compare
Map Invert
Gain 50%
Baseline
Density
Filter 1
Frequency Fusion 3
Focus
Scale
Steering
Magnify 1.0

Controls

Cardiac primary

With Color active, touch **PW**, **CW**, or **MMode** to go into PW Color, CW Color, or MMode Color (combination) mode. The second mode control (**PW**, **CW**, or **MMode**) is highlighted, and the **Color** touch control is outlined by a box, indicating that Color mode is still active. To exit the combination mode, touch **Color**. Now the **Color** touch control is highlighted, indicating that only Color mode is active.

Baseline	Unwraps aliased signals. Shows higher velocities flowing in one direction by lowering color assignments for velocities flowing in the other direction.
B/W Suppress	Suppresses the black-and-white image that appears outside of the color image, thereby increasing the frame rate. Available with sector and curvilinear array transducers.
Color Compare	Displays grayscale and color versions of an image side by side.
Color Suppress	Removes color from an image while remaining in Color mode. Frame rate is unaffected.
Density	Trades off resolution versus frame rate by varying line density. Not available in Tissue Doppler mode.
Filter	Removes low-level signals and reduces noise in the image.
Focus	Repositions the acoustic depth of the color focal zone. When adaptive flow is on, the focus chooses the optimal color frequency.
Frame Rate	Trades off resolution for frame rate. Values are 1–5. Higher values indicate higher frame rates. Only available in Tissue Doppler mode.

Frequency Fusion	Optimizes frequencies for penetration, texture or resolution. Changes are reflected in the Frequency Fusion icon.
Gain	Adjusts system sensitivity to received color flow signals. Increasing the color gain percentage increases the amount of color displayed.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Pan	When **Zoom** is on (fully highlighted), enables the trackball to move the zoom/color box area over the image.
Scale	Changes the range of color flow velocities. Lower the scale to see slow flow, and increase it to see higher velocities.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Spectral	Reformats the screen display to turn a Doppler spectral trace on or off.
Sweep	Changes the sweep speed of the ECG waveform. Available speeds are 25, 50, 100, and 150 mm/sec.
Tissue Doppler	Turns Tissue Doppler imaging mode on or off. Not available when the image has been frozen using the **Freeze** key.
Zoom	Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (**Position** is active when you first enter zoom preview). To resize the zoom preview area, press **Size** and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Cardiac secondary

Adaptive Flow	Selects an optimal color flow frequency and focal depth and adjusts the PRF based on the size and location of the color flow window. (See "Using Color Imaging" on page 7-70.)
Colorize	Optimizes contrast resolution by activating the current colorization map, and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
LGC	Touch control that turns the Lateral Gain Controls on and off.
Map	Changes the color flow map used for real-time and looping images. Maps represent conventions and flow characteristics assigned to the selected BART (Blue Away, Red Toward) or RABT (Red Away, Blue Toward) map.
Map Invert	Switches between the BART (Blue Away, Red Toward) and the RABT (Red Away, Blue Toward) color map conventions.
Packet	Selects the color flow packet size **S** (small), **M** (medium), or **L** (large). This determines how the system samples and processes color flow information. Not available in Tissue Doppler mode.
Persist	Adjusts the amount of color frame averaging, which can give a smoother appearance.

Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power. Is displayed as a primary right-touch-panel control set when **Contrast** is on.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Smoothing	Adjusts the amount of color scan line averaging, affecting the smoothness and sensitivity of the color display.

Noncardiac primary

With Color active, touch **PW**, **CW**, or **MMode** to go into PW Color, CW Color, or MMode Color (combination) mode. The second mode control (**PW**, **CW**, or **MMode**) is highlighted, and the **Color** touch control is outlined by a box, indicating that Color mode is still active. To exit the combination mode, touch **Color**. Now the **Color** touch control is highlighted, indicating that only Color mode is active.

Baseline	Unwraps aliased signals. Shows higher velocities flowing in one direction by lowering color assignments for velocities flowing in the other direction.
B/W Suppress	Suppresses the black-and-white image that appears outside of the color image, thereby increasing the frame rate. Available with sector and curvilinear array transducers.
Color Compare	Displays grayscale and color versions of an image side by side.
Color Suppress	Removes color from an image while remaining in Color mode. Frame rate is unaffected.
Density	Trades off resolution versus frame rate by varying line density.

Filter	Removes low-level signals and reduces noise in the image. It is recommended that you use **Filter T** with turbulence maps only.
Focus	Repositions the acoustic depth of the color focal zone.
Frequency Fusion	Optimizes frequencies for penetration, texture, or resolution. Changes are reflected in the Frequency Fusion icon and on the process line displayed at the top left corner of the screen.
Gain	Adjusts system sensitivity to received color flow signals. Increasing the color gain percentage increases the amount of color displayed.
L/R Invert	Switches the left/right orientation of the image. Appears on the secondary touch panel in cardiac presets and on the right primary touch panel in noncardiac presets. Also appears on the left touch panel under the Image controls.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Map Invert	Switches between the BART (Blue Away, Red Toward) and RABT (Red Away, Blue Toward) color map conventions.
Pan	When **Zoom** is on (fully highlighted), enables the trackball to move the zoom/color box area over the image.
Scale	Changes the range of color flow velocities. Lower the scale to see slow flow, and increase it to see higher velocities.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Spectral	Reformats the screen display to turn a Doppler spectral trace on or off.

Steering	Steers linear color images to the right or left, to achieve optimal color flow angles. The baseline also returns automatically to the selected position.
Zoom	Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (**Position** is active when you first enter zoom preview). To resize the zoom preview area, press **Size** and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Noncardiac secondary

Adaptive Flow	Selects an optimal color flow frequency and focal depth and adjusts the PRF based on the size and location of the color flow window. (See "Using Color Imaging" on page 7-70.)
Colorize	Optimizes contrast resolution by activating the current colorization map, and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Color Priority	Displays all received color data by giving higher priority to Color, overriding BMode information.
Color Tag [1, 2]	Shows all flow above a selected mean velocity in bright green. Also turns off **Color Tag**.
LGC	Turns the Lateral Gain Controls on and off. Not available with linear probes.
Map	Changes the color flow map used for real-time and looping images. Maps represent conventions and flow characteristics assigned to the selected BART (Blue Away, Red Toward) or RABT (Red Away, Blue Toward) map.
Packet	Selects the color flow packet size **S** (small), **M** (medium), or **L** (large). This determines how the system samples and processes color flow information.

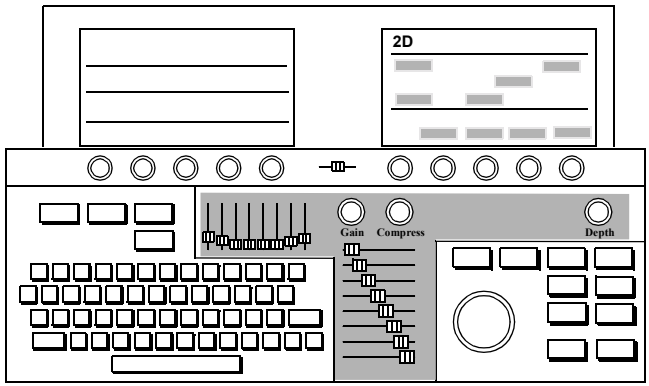
Peak Hold	Displays, in color, the accumulated maximum flow velocities detected during a period of time (which must be defined using Setup).
Persist	Adjusts the amount of color frame averaging, which can give a smoother appearance.
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power. Appears as part of the primary control set on the right touch panel when **Contrast** is on.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Smoothing	Adjusts the amount of color scan line averaging, affecting the smoothness and sensitivity of the color display.
Tag Position	Adjusts the mean velocity for either **Color Tag 1** or **Color Tag 2**, whichever is currently on. Activated when you touch **Color Tag**.
Trapezoid	Activates trapezoidal imaging, which widens the linear image to a trapezoid shape. Available only with transducers that offer this feature.

Setup

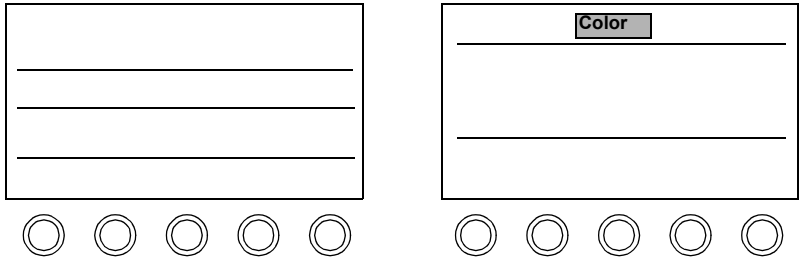
Peak Hold	Selects the number of seconds of color flow display when **Peak Hold** and Freeze are active.

Using Color Imaging

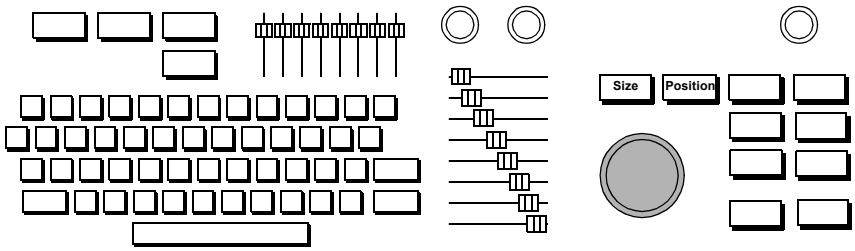
1. Optimize the 2D/BMode image using the keyboard imaging controls.



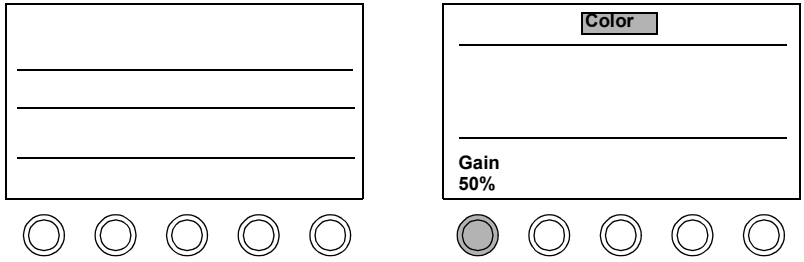
2. Touch **Color.**



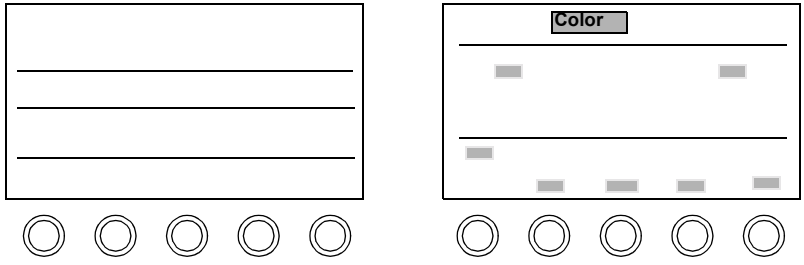
3. Adjust the location of the color area with the trackball. The **Position** key is active when you first enter Color. To change the size of the color area, press **Size** and use the trackball.



4. Adjust **Color Gain**, as necessary. Increasing the percentage increases the amount of color displayed.

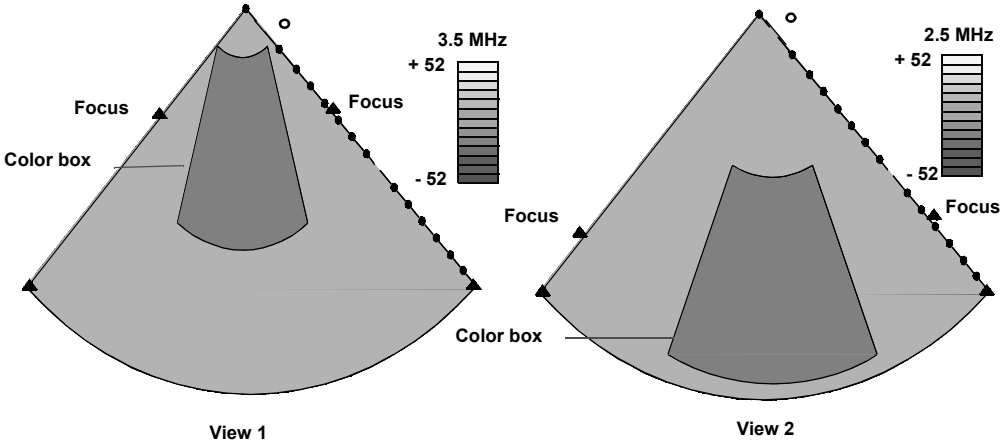


5. Optimize the image using the **Color** touch controls.



Adaptive Flow

Adaptive Flow provides the best color sensitivity at every depth, while keeping the velocity scale constant. The following illustration shows Adaptive Flow side-by-side images with the color box set to different depths:



View 1 - Color box at shallow depth
View 2 - Color box at deeper depth

Tip: The system automatically provides the optimal color frequency, focus and adjusts the PRF.

Following are some Adaptive Flow guidelines:

- As the color box moves to the top of the sector (shallow depth), the system uses a higher color flow frequency (View 1).
- When the color box moves to the bottom of the sector, the system uses a lower color flow frequency (View 2).
- The user may override the selected frequency by

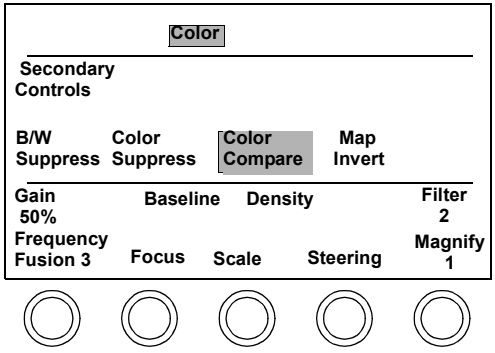
  •Moving the **Focus** rotary control to a new depth in the color box

  •Disabling **Adaptive Flow**

Color Compare

Color Compare mode allows you to quickly compare color and grayscale versions of the same image. The color image is displayed on the right, and the grayscale on the left. Color Compare is not available with spectral Doppler.

1. While displaying a live color image, touch **Color Compare**. The live color image appears next to a live grayscale image.

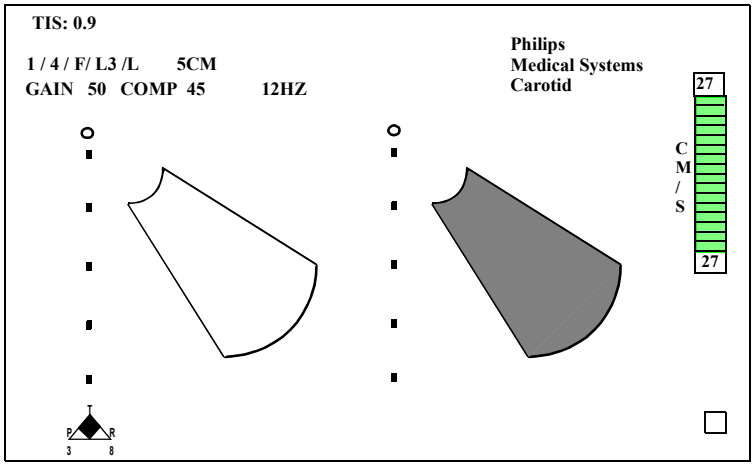


2. To freeze both images, press **Freeze**.

3. To display both images side by side with color suppressed, touch **Color Suppress**.

4. To turn off compare mode, touch **Color Compare** again.

The following illustration shows the Color Compare screen:



Color Troubleshooting

Always make sure the active preset is appropriate for the study being performed. If necessary, adjust the and monitor controls for the ambient light.

Symptoms	Suggestions
Not sensitive.	Adjust **Color Gain**. It could be either too high or too low. **Scale**. **Power**, if not at 100%. Adjust **Focus** to point at the area of interest. Adjust **Smoothing**. Turn **Color Priority** on for small vessels. Use a lower frequency transducer. Reposition the transducer, or try another imaging window. **Filter** setting for optimal sensitivity. Choose a larger packet size, such as **L** (large). **Density**. Turn off **Adaptive Color**.
Need a higher frame rate.	For sector or curvilinear array transducers, remove the grayscale image outside the color area by turning on **B/W Suppress**. Decrease the width of the color area by pressing Size and using the trackball. **Density**. Use a smaller packet size. **Scale**. **Depth**.

Symptoms	Suggestions
Color is too speckled.	**Smoothing** to smooth the image. **Gain**. For slow-moving blood or structures, **Persist**.
Excessive turbulence seen using turbulence maps.	When using turbulence maps, always use **Filter T** (for vascular presets only).
Color display is aliasing.	**Scale** to see more high-velocity blood flow information, and remove more low-velocity information. Adjust **Baseline** to unwrap aliased signals. Change to a lower frequency transducer.
Need better color resolution.	Vascular: Make sure that **Adaptive Flow** is on. With linear transducers, use **Steering** to achieve optimal color flow angles by steering the image to the right or left. For small vessels: **Smoothing**. **Density**. **Packet** size. Turn on **Color Priority** to view small vessels.

Symptoms	Suggestions
Need better color filling.	Adjust **Steering**. **Color Gain**. **Scale**. **Smoothing**. **Color Filter**. Adjust **Focus**. If a decrease in frame rate is acceptable **Packet** size. **Filter**. Disable **Adaptive Flow**. For slow-moving blood or structures, **Persist**. Use **Peak Hold** to accumulate color velocities.
Cannot see fast-moving velocities.	**Scale** to display higher velocities. Increase the frame rate by decreasing the width of the color area (press **Size** and use the trackball). Also be sure **B/W Suppress** is active for sector transducers. **Persist** to decrease frame averaging.
Cannot see slow moving velocities.	Use **Steering** to make color as parallel to flow as possible. **Scale** to see more low-velocity blood flow information. **Filter**. For small vessels, **Smoothing**. **Power**. Turn **Color Priority** on to display more color (noncardiac presets only). Enable **Adaptive Flow**. **Scale**.

Symptoms	Suggestions
Color image is noisy, flashing, or has artifacts. Tip: Mechanical heart valves occasionally cause unavoidable flashing artifacts. Artifacts also could be caused by external sources such as lighting, other equipment, or telecommunications devices.	**Smoothing** to smooth the image. **Filter**. **Scale**. **Color Gain**. For slow-moving blood or structures, **Persist** to increase frame averaging. Narrow the color box to remove the source of artifacts.
Difficult to determine the amount of turbulence.	Select **Map B**, **C**, or **I** and use **Filter T** (if available with the selected preset.)
Color images are printed on the wrong printer.	Press Setup, touch **Print**, and adjust **Color [printer]** to display the printer to use for color images.

PW and CW Imaging

Introduction

Pulsed Wave Doppler (PW) mode provides a “spectral” representation of the velocity of blood flow or tissue movement. Velocities are represented on graphs that use a cm/sec scale to enable velocities to be measured and tracked over time. The “Pulsed” in PW means that the transducer is sending the ultrasound pulse and receiving its echo through a single crystal. This permits you to sample velocities at specific depths.

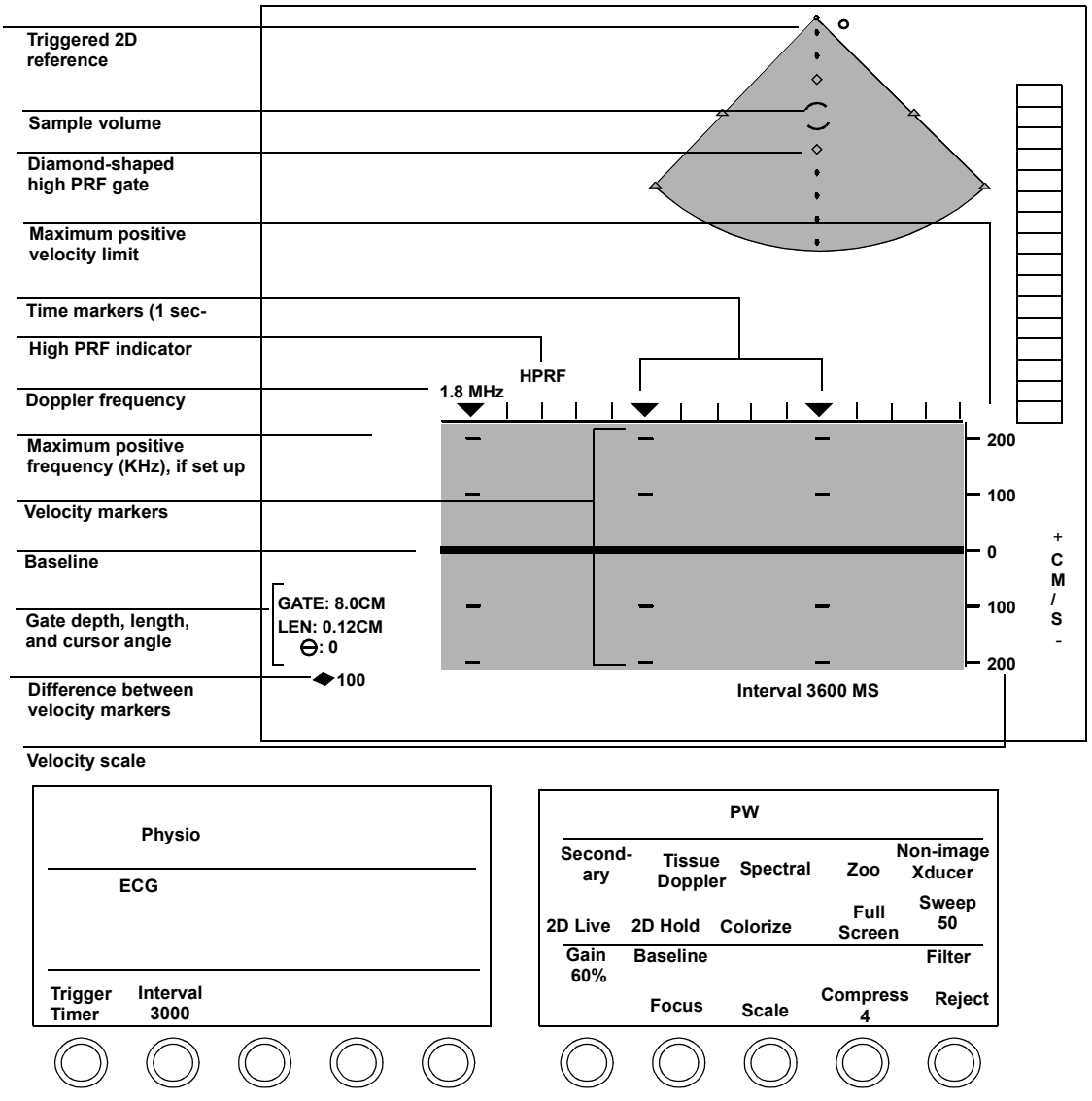
Continuous Wave Doppler (CW) provides the same spectral display as PW, but the transducer uses separate crystals to transmit ultrasound pulses and receive their echoes. This permits you to sample higher velocities than in PW mode. But CW samples along the entire line of sight, and can exhibit more interference from movement.

This section describes

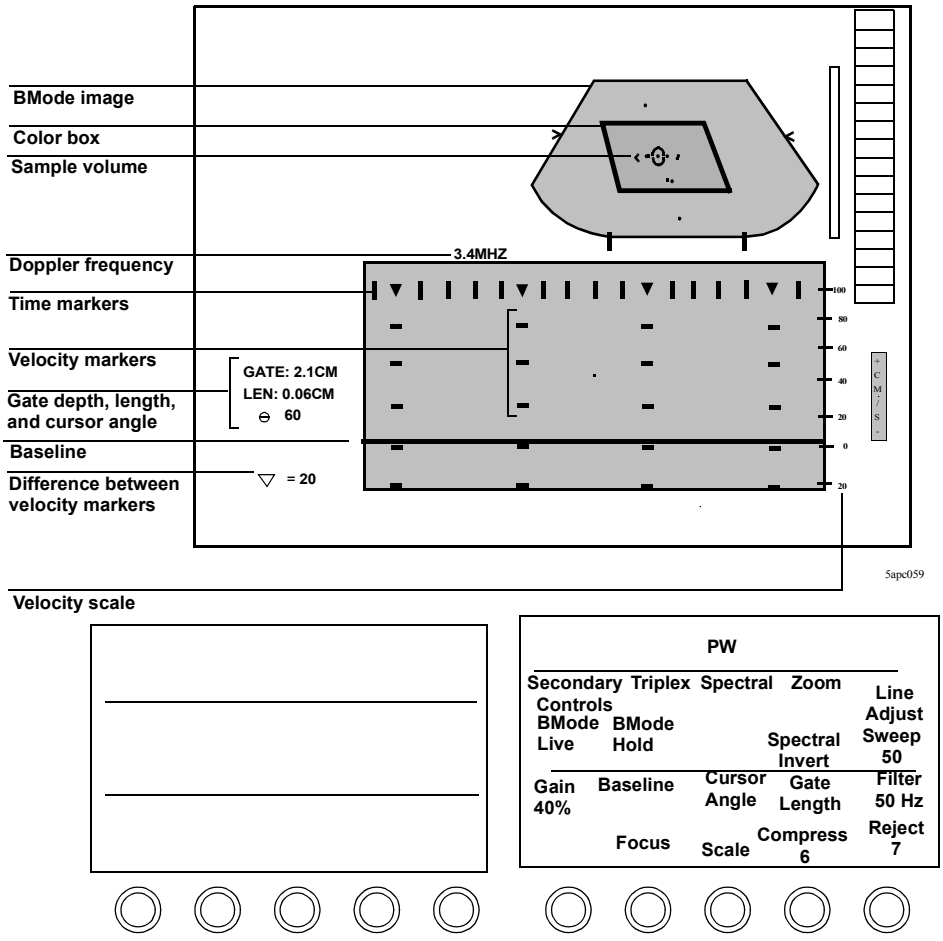
- PW and CW screens and touch panels (page 7-80)
- Controls (page 7-82)
- Using PW imaging (page 7-93)
- Using CW imaging (page 7-101)
- Troubleshooting PW and CW images (page 7-105)

Screen and Touch Panels

Cardiac



PW Spectral (Noncardiac)



Controls

Cardiac primary

NOTE

The screen can display an image and trace using four different formats. For more information, see "Displaying spectral and MMode traces" on page 7-57.

Unless otherwise specified, controls pertain to both PW and CW Doppler. Angio mode can be combined with both PW and CW imaging.

2D Hold	Freezes the 2D reference image and provides an uninterrupted Doppler spectrum. Is displayed only when **Spectral** is on.
2D Live	Freezes the Doppler spectrum and returns the 2D reference image to real-time. Is displayed only when **Spectral** is on, and an imaging transducer is active.
Baseline	Unwraps aliased signals by adjusting the zero baseline on the Doppler spectrum. Is displayed only when **Spectral** is on.
Colorize	Optimizes contrast resolution by activating the current colorization map and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Compress	In conjunction with the **Reject** rotary control, adjusts the grayscale of the Doppler spectrum.
Filter	Removes audible signals of frequencies below the hertz level specified. For lower filter settings, both audio and spectral information are removed.
Focus	Repositions the acoustic depth of the color focal zone.
Full Screen	If an MMode Trace or Spectrum is present, toggles between full size trace and the last used mode format defined by **Image Size**.

Gain	Adjusts the amplitude of received Doppler signals and noise.
Nonimage Xducer	Activates nonimage CW transducer. Appears only when a nonimaging transducer is plugged in.
Print	Produces a hard copy of the screen display. If the onscreen image is live, it briefly freezes during printing and then returns to live imaging. You also can use the foot switch pedal to print information.
Reject	In conjunction with **Compress**, adjusts the grayscale of the Doppler spectrum. Removes low-level Doppler signals.
Scale	Adjusts the range of Doppler velocities displayed. When the **Scale** setting is increased beyond standard PW levels, high PRF is activated. The HPRF label is displayed above the waveform, and diamond-shaped gates are displayed on the image. The high PRF feature displays higher velocity flow.
Spectral	Displays the Doppler spectrum on the screen. Turns off **Spectral** in PW mode, which makes PW Doppler audio available.
Sweep	Changes the sweep speed for the Doppler spectrum, and any active physios. Is displayed only when **Spectral** is on. Available speeds are 25, 50, 100, and 150 mm/sec.
Tissue Doppler	Turns Tissue Doppler mode on and off. Not available in CW.
Zoom	Turns 2D/BMode zoom (magnification) on or off. To move the zoom preview area, use the trackball (Position is active when you first enter zoom preview). To resize the zoom preview area, press Size and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Cardiac secondary

ADP	Turns adaptive Doppler on and off. Adaptive Doppler enhances the signal in a spectral display relative to the background noise.
Cursor Angle	Adjusts the angle-correction cursor to an estimated angle of flow direction (from 0 to 80 degrees).
Gate Length	Adjusts the size of the PW gate.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power.
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Spectral Invert	Affects whether velocities moving toward the transducer are displayed above or below the zero baseline. When using noncardiac presets, **Spectral Invert** also changes the sign (+/-) on the Doppler scale. Is displayed only when **Spectral** is on.

Cardiac setup

With CW or PW active, press Setup to adjust these controls. Press Setup again to return to live imaging.

Baseline Suppress	Removes spectral representations of frequencies below the filter setting.
Frequency Scales	Turns the display of frequency scales and frequency measurements on or off.
Optimum Angle	Adjusts the optimum angle-to-flow for linear transducers (PW only). Most vascular labs use 50 to 60 degrees.
Temporal Smooth	Adjusts the amount of horizontal spectral smoothing, to show envelope outlines according to visual preference.
Units	Sets the display of the Doppler velocity scale to cm/s or m/s (centimeters per second or meters per second). Changing the display units from cm/s to m/s does not change the units used for analysis. Analysis information is always displayed in cm/s.
Velocity Smooth	Adjusts the amount of vertical spectral smoothing, to show the most commonly occurring velocities according to visual preference.

Noncardiac primary

Unless otherwise specified, controls pertain to both PW and CW Doppler. Angio and Color modes can be combined with both PW and CW imaging.

Audio	Turns PW Doppler audio on or off. Available when **PW** is on and **Spectral** and **Color** are off.
Baseline	Unwraps aliased signals by adjusting the zero baseline on the Doppler spectrum. Is displayed only when **Spectral** is on.
BMode Hold	Freezes the BMode reference image and provides an uninterrupted Doppler spectrum. Is displayed only when **Spectral** is on and an imaging transducer is active.
BMode Live	Freezes the Doppler spectrum and returns the BMode reference image to real-time. Is displayed only when **Spectral** is on, and an imaging transducer is active.
Color Gain	Adjusts system sensitivity to received color flow signals. Increasing the color gain increases the amount of color displayed. Is displayed as part of the **Color** and **BMode Live** control set.
Color Scale	Changes the range of color flow velocities. Is displayed as part of the **Color** and **BMode Live** control set.
Color Steering	Steers linear color images to either the right or left, to achieve optimal color flow angles. When using a linear transducer in a vascular preset, the color map automatically inverts if you steer the transducer from left to right. The baseline also returns to its original position automatically. Is displayed as part of the **Color** and **BMode Live** control set.
Compress	In conjunction with the **Reject** rotary control, adjusts the grayscale of the Doppler spectrum. Is displayed only when **Spectral** is on.
Cursor Angle	Adjusts the angle-correction cursor to an estimated angle of flow direction (from 0 to 80 degrees).

Duplex	Activates simultaneous Duplex Doppler mode for PW Doppler vascular, abdominal, or OB/GYN exams. Not available when **Color** is on.
Filter	Removes audible signals of frequencies below the hertz level specified. For lower filter settings, both audio and spectral information are removed. Is displayed only when **Spectral** is on.
Focus	Repositions the acoustic depth of the color focal zone.
Gain	Adjusts the amplitude of received Doppler signals and noise. Is displayed only when **Spectral** is on.
Gain (Angio)	Adjusts system sensitivity to received angio signals. Increasing the angio gain percentage increases the amount of color displayed. Is displayed as part of the **Angio** and **BMode Live** control set.
Gate Length	Adjusts the size of the PW gate.
Line Adjust	Provides access to **Line Angle**. When off, the system positions the PW Doppler interrogation line (**Intelligent Doppler** feature) based on the **Optimum Angle** setting. Available only with linear transducers.
Line Angle	Lets you manually position the PW Doppler interrogation line. Only available when a linear transducer is active and **Line Adjust** is on.
Nonimage Xducer	Activates the connected nonimaging transducer.
Print	Produces a hard copy of the screen display. If the onscreen image is live, it briefly freezes during printing and then returns to live imaging. You also can use the foot switch pedal to print information.
Reject	In conjunction with **Compress**, adjusts the grayscale of the Doppler spectrum. Removes low-level Doppler signals. Is displayed only when **Spectral** is on.

Scale	Adjusts the range of Doppler velocities displayed. When the **Scale** setting is increased beyond standard PW levels, high PRF is activated. The HPRF label is displayed above the waveform, and diamond-shaped gates are displayed on the image. The high PRF feature displays higher velocity flow. Is displayed only when **Spectral** is on.
Scale (Angio)	Changes the range of angio flow velocities whose amplitude can be displayed. This affects the PRF. Lower the scale to see slow flow, and increase it to see higher velocities. Is displayed as part of the **Angio** and **BMode Live** control set.
Scroll/Trace Image	Causes image to toggle between scrolling the trace display and the reference image. To use **Scroll**, you must first press **Freeze**.
Spectral	Displays the Doppler spectrum on the screen.
Spectral Invert	Affects whether velocities moving toward the transducer are displayed above or below the zero baseline. **Spectral Invert** also changes the sign (+/-) on the Doppler scale. Is displayed only when **Spectral** is on.
Steering (Angio)	Steers linear angio images to the right or left, to achieve optimal angio flow angles. The baseline also returns automatically to the selected position. Is displayed as part of the **Angio** and **BMode Live** control set.

Sweep — Changes the sweep speed for the Doppler spectrum. Is displayed only when **Spectral** is on. Available speeds are 25, 50, 100, and 150 mm/sec.

Threshold — Determines the type of signals used in calculating the trace waveform. A higher setting indicates lower level pixels are used to calculate the trace waveform. To use, first press Freeze .

Trace — [**Trace Auto**, **Trace Top**, **Trace Bottom**]
Works in conjunction with autotrace's blue line. Press the Freeze key and then touch **Trace Auto**. You can then toggle through the trace selections. **Trace Auto** includes PW information which is seen above and below the baseline. **Trace Top** displays the signal above the baseline, and **Trace Bottom** displays the signal below the baseline.

Triplex — Activates simultaneous triplex Doppler mode, in which both the image and Doppler spectral trace are live with **Color/Angio** on. Available in vascular presets.

Waveform Suppress — Suppresses waveform line used for autotrace after Freeze.

Zoom — Turns BMode zoom (magnification) on or off. To move the zoom preview area, use the trackball (Position is active when you first enter zoom preview). To resize the zoom preview area, press Size and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

Noncardiac secondary

The **Meas Bar** controls are available only when you are doing an automatic Doppler trace. To activate the **Meas Bar** controls, press Freeze and then Trace. To do an automatic Doppler trace, be sure that the **Doppler Trace** control is enabled in Setup. To do a manual Doppler trace, press Caliper and then Trace.

ADP	Turns adaptive Doppler on and off. Adaptive Doppler enhances the signal in a spectral display relative to the background noise.
Colorize	Optimizes contrast resolution by activating the current colorization map, and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Full Screen	If an MMode trace is present, toggles between a full size trace and the last used format defined by **Image Size**.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Meas Bar D (time)	Adjusts the position of the Measure Bar D time markers on a Doppler Trace. The Measure Bar D markers indicate the end-diastolic velocity and time points (D) that have been automatically chosen by the system. To use, first press Freeze .
Meas Bar D (vel)	Adjusts the position of the Measure Bar D velocity markers on a Doppler Trace. The Measure Bar D markers indicate the end-diastolic velocity and time points (D) that have been automatically chosen by the system. To use, first press Freeze .
Meas Bar S (time)	Adjusts the position of the Measure Bar S time markers on a Doppler Trace. The Measure Bar S markers indicate the systolic velocity and time points (S) that have been automatically chosen by the system. To use, first press Freeze .

Meas Bar S (vel)	Adjusts the position of the Measure Bar S velocity markers on a Doppler Trace. The Measure Bar S markers indicate the systolic velocity and time points (S) that have been automatically chosen by the system. To use, first press **Freeze** .
Meas Bar S1 (time)	Adjusts the position of Measure Bar S1 time markers on an automatically selected and traced spectral segment. The Measure Bar S1 markers indicate the systolic point of the next complex in the automatically traced spectral segment. To use, first press **Freeze** .
Meas Bar S1 (vel)	Adjusts the position of Measure Bar S1 velocity markers on an automatically selected and traced spectral segment. The Measure Bar S1 markers indicate the systolic point of the next complex in the automatically traced spectral segment. To use, first press **Freeze** .
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power.
Trapezoid	Activates trapezoidal imaging, which widens the linear image to a trapezoid shape. Available only with transducers that offer this feature.

Noncardiac setup

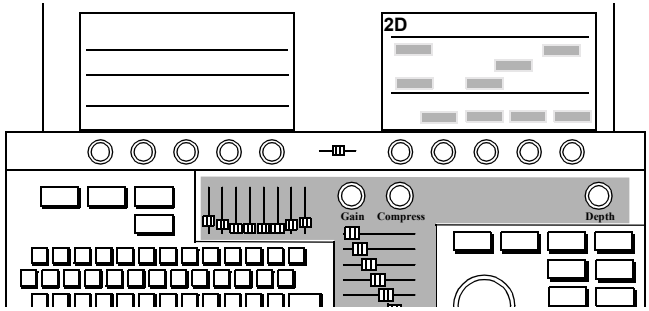
With **PW** active, press Setup to adjust these controls. Press Setup again to return to live imaging.

Baseline Suppress	Removes spectral representations of frequencies below the **Filter** setting.
Frequency Scales	Turns the display of frequency scales and frequency measurements on or off.
Interval	Adjusts the update rate of the BMode reference image, when **Duplex** is off.
Optimum Angle	Adjusts the optimum angle-to-flow for linear transducers (PW only). Most vascular labs use 50 to 60 degrees.
Temporal Smooth	Adjusts the amount of horizontal spectral smoothing, to show envelope outlines according to visual preference.
Units	Sets the display of the Doppler velocity scale to cm/s or m/s (centimeters per second or meters per second). Changing the display units from cm/s to m/s does not change the units used for analysis. Analysis information is always displayed in cm/s.
Velocity Smooth	Adjusts the amount of vertical spectral smoothing, to show the most commonly occurring velocities according to visual preference.

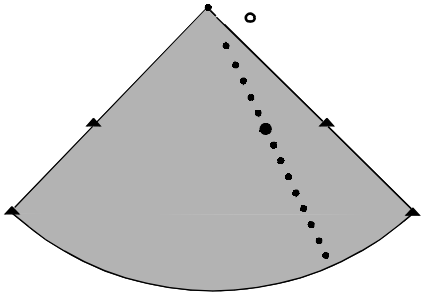
Using PW Imaging

NOTE Angio and Color modes can be combined with PW imaging.

1. Optimize the 2D/BMode image using the keyboard imaging controls.

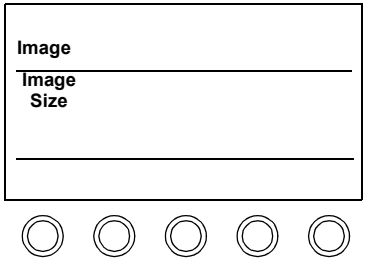


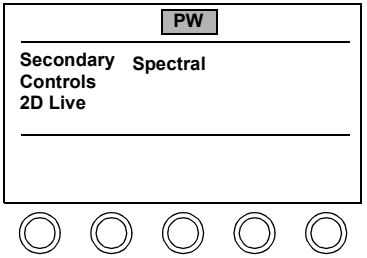
2. Position the cursor line with the trackball. Place the larger dot on the cursor line where you want the PW sample volume to be.



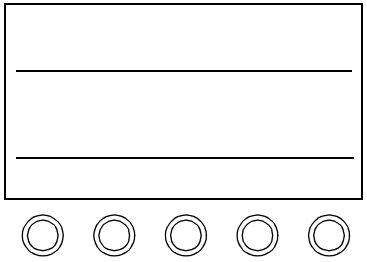
Tip: **Spectral** turns the spectral display on or off. Activating **2D Live** or **BMode Live** lets you more accurately place the sample volume.

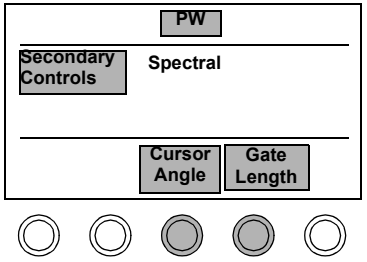
3. Touch **PW**, and adjust the sample volume position, as necessary. Touch **Image Size** to change the 2D/BMode image size. Use the Volume slider to adjust the audio.



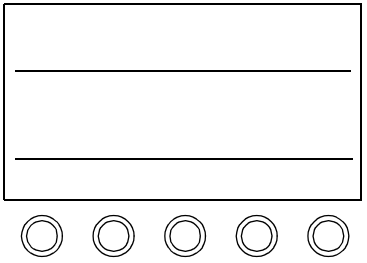


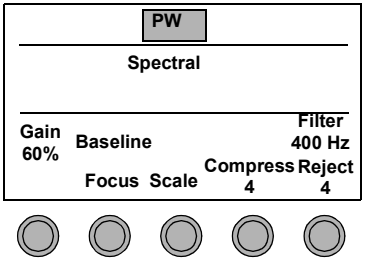
4. Adjust the gate size with **Gate Length** and the estimated angle of flow with **Cursor Angle.**





5. Adjust the **Baseline, Gain, Filter, Compress, Reject,** and **Scale** rotary controls, as necessary. Optimize the spectral display using any **PW** touch controls.

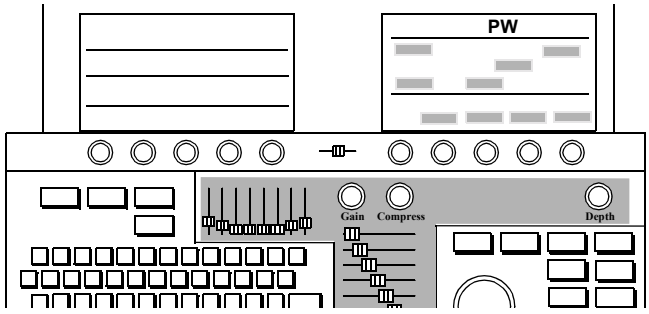




Auto Trace in PW (noncardiac)

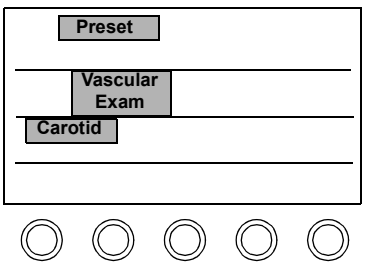
Use Trace to obtain a quick, comprehensive vascular measurement.

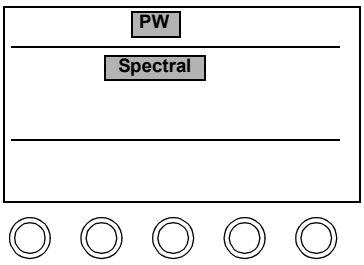
1. Optimize the PW image.



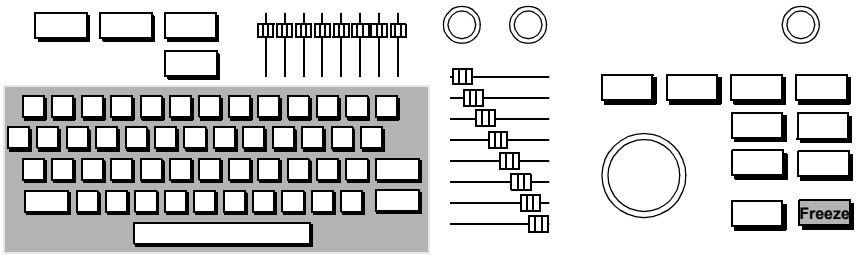
Tip: You can also press **Enter** to enter Spectral Trace from PW preview mode.

2. With **Preset**, **Vascular Exam**, and **Carotid** active, touch **PW** and **Spectral**.



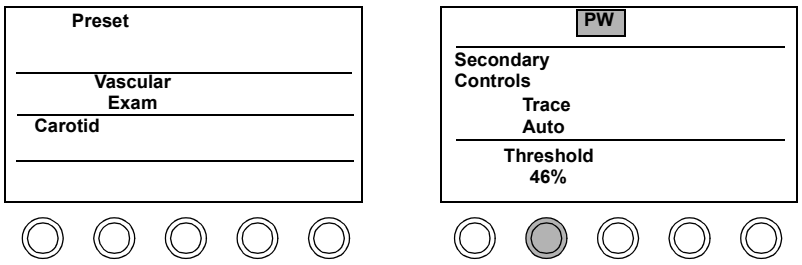


3. Press **Freeze**.



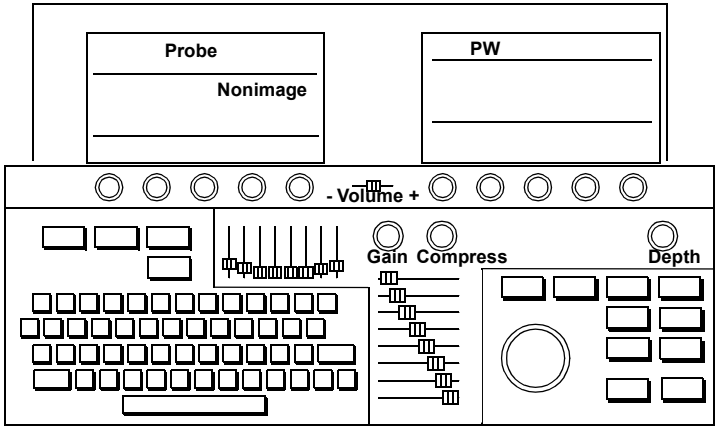
Tip: When adjusting **Threshold** settings, a higher setting indicates lower level pixels are used in calculating the trace waveform.

4. Adjust the **Threshold** if necessary. Touch **Trace Auto** and touch the desired **Trace** setting (**Auto**, **Top**, or **Bottom**).



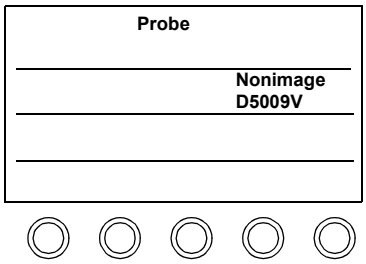
Nonimaging PW

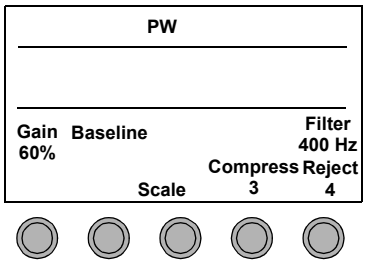
1. Activate the nonimaging transducer by touching **Probe** and **Nonimage** on the left touch panel. If CW is the default for this transducer, touch **PW**. Use the Volume slider to adjust the audio.



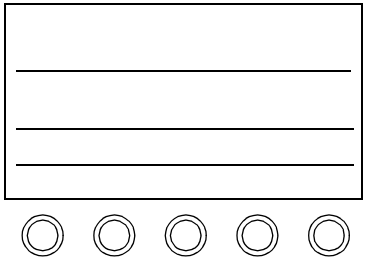
2. Place the sample volume at the correct depth with the trackball, and then optimize the location. The audio and spectral display helps you to locate the best placement.

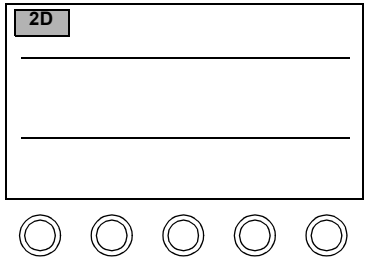
3. Optimize the spectral display.





4. To return to imaging, touch **2D** or **BMode**.





Using Triplex Doppler in PW imaging

The **Triplex** control activates triplex Doppler mode. Triplex Doppler mode is the simultaneous display of a live BMode image, with a live Color or Angio image, and a live Spectral trace. Triplex is available only with the 11-3L transducer in a vascular preset.

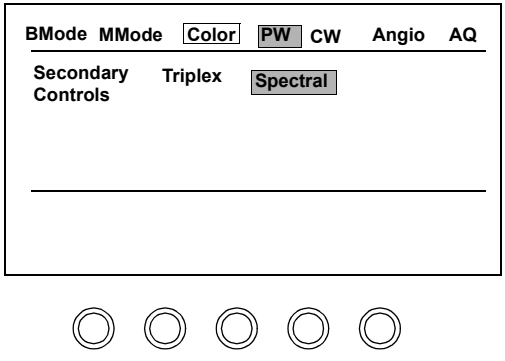
Note the following Triplex Doppler guidelines:

- Touching **PW** or **CW** turns on **Spectral**, unless depth marks are used.
- In **PW** nonspectral mode, pressing the Enter key automatically turns on **Spectral**.
- **Spectral** is available in **2D/BMode**, **Color**, and **Angio** when depth marks are used.
- In **Spectral**, pressing Enter turns on **BMode Live** (**2D-Live** if in Cardiac).
- When **PW** is turned on, the gate automatically moves away from the edge of the image.
- Touching **Cursor Angle** when highlighted sets the angle to zero, except when **Intelligent Doppler** is active or the image is frozen.
- In **PW Spectral**, you can display **Heart Rate** from a Doppler trace and make a measurement.

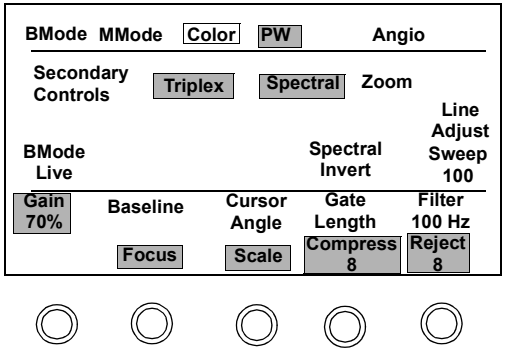
To activate Triplex Doppler

1. Touch **Color**.

2. Touch **PW**, and optimize the image using the keyboard imaging controls. (If **Depth Marks** is set to **Off** in Setup, Spectral mode is automatically turned on).



3. Touch **Triplex** to turn **Triplex** mode on.



Tip: In addition, you can use **BMode Live** to optimize the image.

4. Touch **Spectral** and then optimize the image to optimize Color or Angio once **Triplex** is on.

NOTE

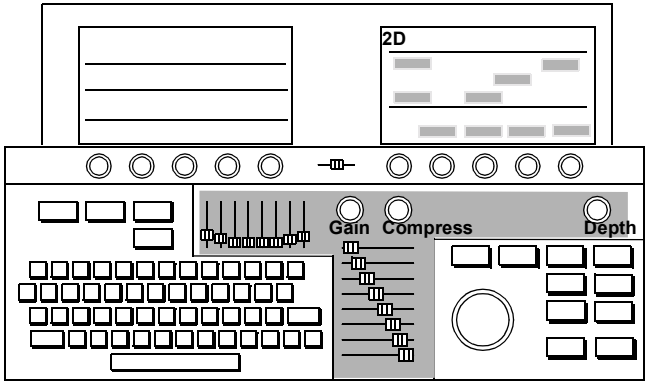
If the scale settings are too low when **Triplex** is activated, adjust the **Baseline** to adjust the scale.

In Triplex mode, the color scale changes to match the Doppler scale.

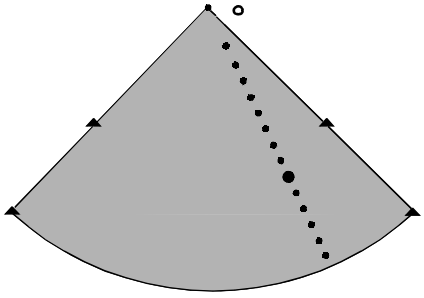
Using CW imaging

Steerable CW

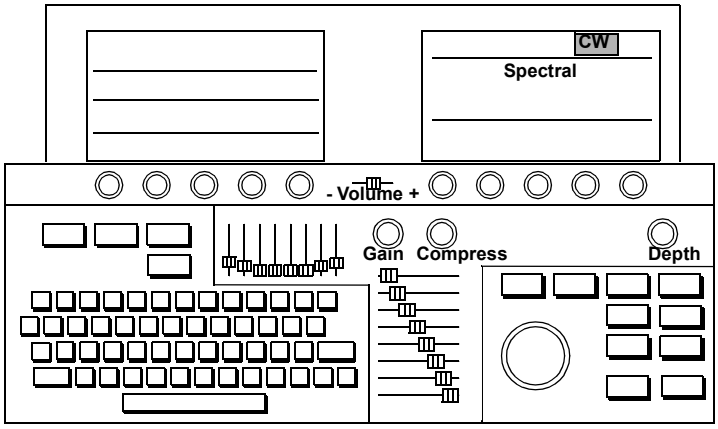
1. Optimize the 2D/BMode image using the keyboard imaging controls.



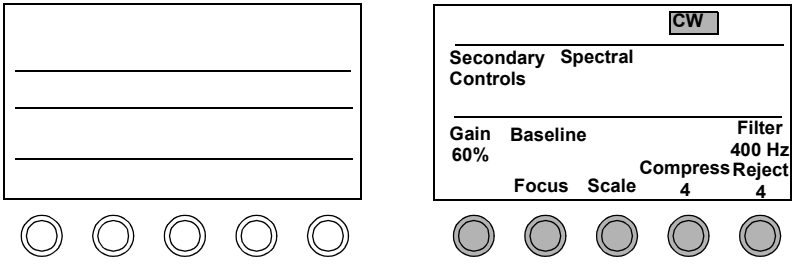
2. Position the cursor line with the trackball. Place the larger dot on the cursor line where you want the CW focal point (diamond) to be.



3. Touch **CW**. Touch **Spectral** to turn the spectral display on and off. Use the Volume slider to adjust the audio.



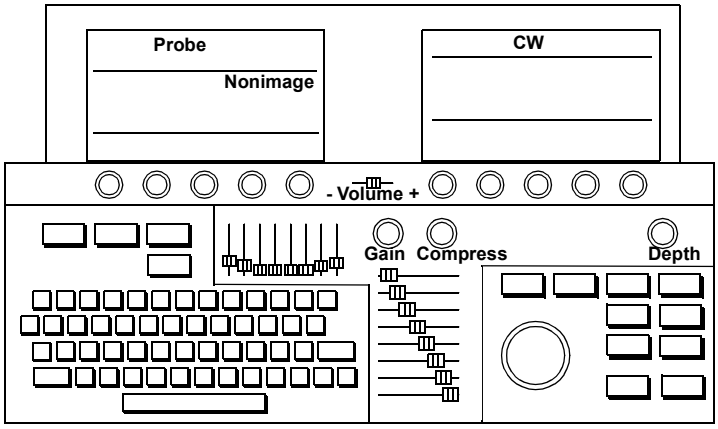
4. Adjust the **Baseline, Gain, Filter, Compress, Reject**, and **Scale** controls, as necessary.



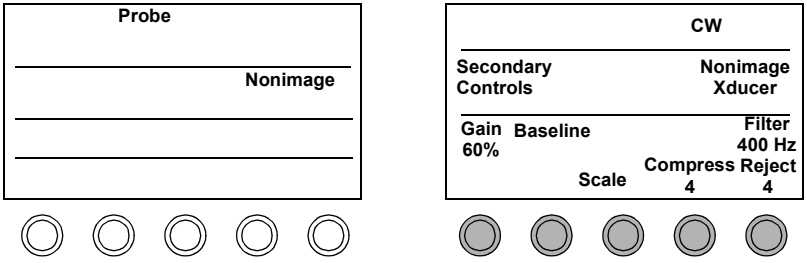
5. Optimize the spectral display using any other CW touch controls.

Nonimaging CW

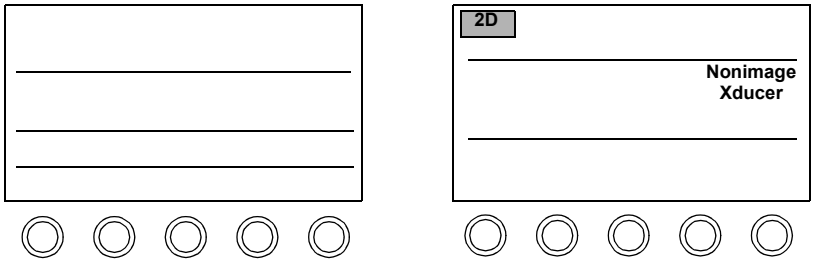
1. Activate the nonimaging transducer by touching **Probe** and **Nonimage** on the left touch panel. Use the Volume slider to adjust the audio.



2. Optimize the spectral display.



3. To return to imaging, touch **2D** or **BMode.**



PW and CW Troubleshooting

Always make sure the active preset is appropriate for the study being performed. If necessary, adjust the ☼ and ◑ monitor controls for the ambient light.

Symptoms	Suggestions
Not sensitive.	**Power**. **Gain**, **Compress**, and **Reject** to increase the amount of Doppler information displayed. For cardiac images, reposition the transducer to make the beam parallel to flow. For vascular images, use **Cursor Angle** to obtain the optimal angle to flow. Position the cursor parallel to and in the same direction as blood flow. To change your preferred angle to flow, press **Setup** and adjust **Optimum Angle**. Change to a lower frequency transducer. Try using **Colorize**, to improve contrast resolution. PW Only: **Gate Length** to increase the sample volume size. CW Only: Place the diamond (focal point) on the cursor line over the area where the greatest sensitivity is needed.
2D/BMode reference image does not update.	Make sure **2D Hold** or **BMode Hold** is turned off. If an R-wave is present **Delay** or **Beats** and **Interval** (all **Physio Trigger** controls). For systems without physios, make sure **Duplex** is off, press **Setup**, and adjust **Interval**. Check ECG leads for proper placement. **ECG Gain** to ensure triggering.
Difficult to get a good acoustic window.	Try using a nonimaging transducer.

Symptoms	Suggestions
Signal is audible, but cannot see it.	Make sure the monitor is adjusted for the ambient light. See "Calibrating the Monitor" on page 1-13 for details. **Gain** to display more Doppler information. **Compress** and **Reject** to increase the range of echoes displayed. **Filter**. For cardiac, readjust the transducer position to get more parallel to flow. For vascular, use **Cursor Angle** to adjust the estimated angle of flow. Turn on **Colorize**. Press Setup and make sure **Baseline Suppress** is off. Make sure that **ADP** is turned on.
Spectrum is noisy.	**Gain** to display less Doppler information. **Filter** to increase the hertz level below which audible signals are removed (fewer signals display). **Reject** to increase the amount of low-level signal removed from the spectrum. **Compress** to eliminate weaker signals and noise from the spectrum. Make sure the sample volume is as small as possible. Press Setup. **Temporal Smooth** and **Velocity Smooth**. Also make sure **Baseline Suppress** is on.
Area around the baseline is blackened out.	**Filter** to decrease the hertz level below which audible signals are removed (more signals display). Press Setup and make sure **Baseline Suppress** is off.
Spectrum is speckled.	Press Setup. **Temporal Smooth** and **Velocity Smooth**.

Tip: Mechanical heart valves occasionally cause unavoidable artifact. Artifact could also be caused by external sources such as lighting, other equipment, or telecommunications devices.

Symptoms	Suggestions
Spectrum is cut off.	Adjust **Baseline** to move the baseline down. **Scale** to increase the range of displayed velocities (also decreases the waveform size).
Artifact in spectrum.	**Gain**, **Filter**, and **Power**.

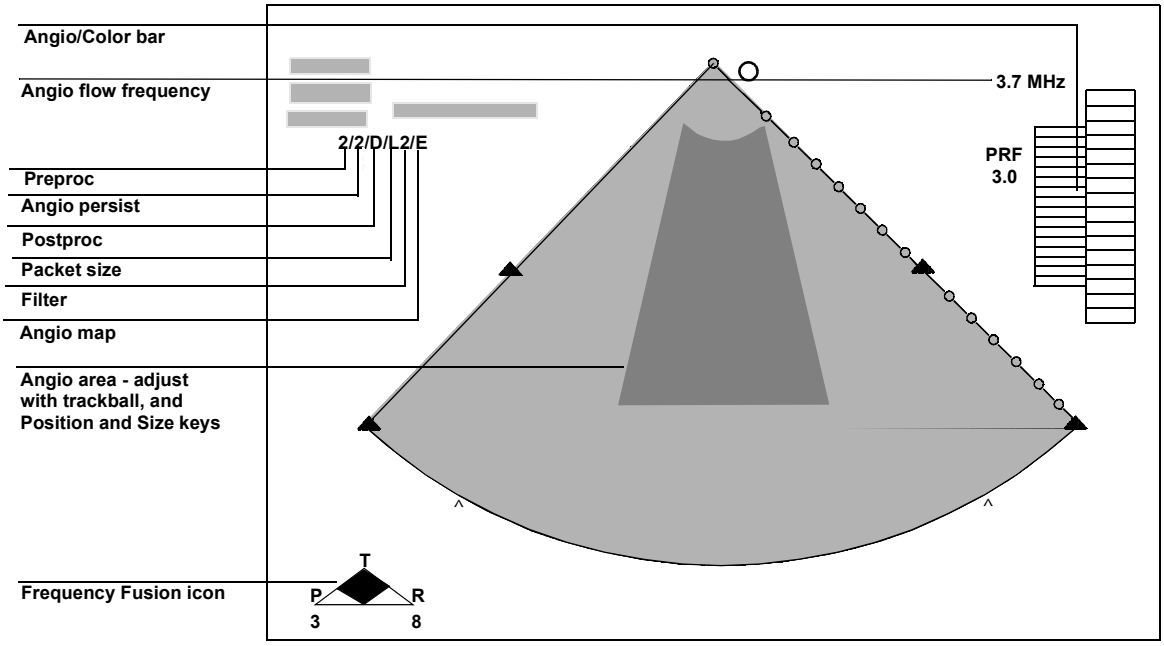
Angio Imaging

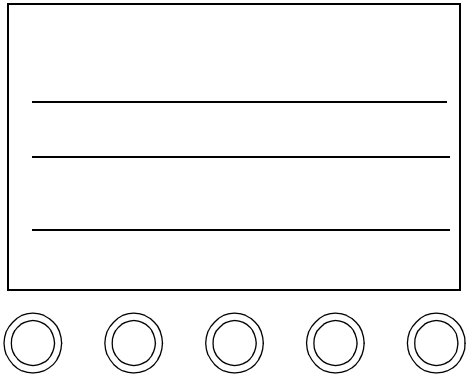
Introduction

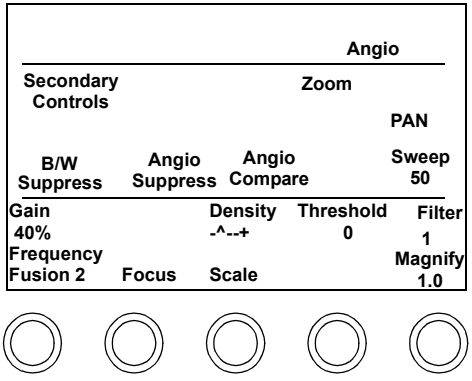
Angio is an “amplitude-only” mode that translates the magnitudes of returning ultrasound echoes into shades of a single color. It is used mostly with Contrast Imaging, because it is more sensitive to reactions of contrast-agent microbubbles that are struck by ultrasound. Angio mode does not reveal movement velocities or directions.

NOTE Angio imaging is not available in MMode.

Screen and Touch Panels







Controls

This section discusses controls for Angio. For information on using Angio with contrast agents in cardiac presets, see *Using Contrast Imaging*.

With **Angio** active, touch **PW** or **CW** to go into PW Angio or CW Angio (combination) mode. The second touch control (**PW** or **CW**) is highlighted, and the **Angio** control is outlined by a box, indicating that Angio mode is still active. To exit the combination mode, touch **Angio**. Now the **Angio** control is highlighted, indicating that only Angio mode is active.

Primary

Angio Suppress	Removes the color from an image while in Angio mode. When in combination with **PW** or **CW**, the **Angio** control is not lit, but is still active and the frame rate is unaffected.
Angio Compare	Compares an angio image with a grayscale version of the same image. The angio image is displayed on the right, and the grayscale version on the left.
B/W Suppress	Suppresses the black and white image that appears outside of the color image, thus increasing the frame rate. Available with sector and curvilinear array transducers.
Density	Trades off resolution versus frame rate by varying line density.
Filter	Removes low-level signals and reduces noise in image.
Focus	Repositions the acoustic depth of the angio focal zone. When Adaptive Angio is on, the focus chooses the optimal angio frequency.
Frequency Fusion	Optimizes frequencies for penetration, texture or resolution. Changes are reflected in the Frequency Fusion icon.

Gain	Adjusts system sensitivity to received angio signals. Increasing the angio gain percentage increases the amount of color displayed.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes.
Pan	When the **Pan** control is on, repositioning and resizing affect the color area.
Scale	Changes the range of angio flow velocities whose amplitude can be displayed. This affects the PRF. Lower the **Scale** to see slow flow, and increase it to see higher velocities.
Steering	Steers linear angio images to the right or left to achieve optimal angio angles. Only available with linear probes.
Sweep	Changes the sweep speed of the ECG waveform. Available speeds are 25, 50, 100, and 150 mm/sec.
Threshold	Eliminates the lowest amplitude signals, allowing you to adjust the noise level shown in the image. Available in real-time, and on acquired and retrieved loops.
Zoom	Turns zoom (magnification) on or off. To move the zoom preview area, use the trackball (**Position** is active when you first enter zoom preview). To resize the zoom preview area, press **Size** and use the trackball. Then touch **Zoom** again to enter full zoom mode.

Tip: When activated, **Zoom** is first outlined by a box. This indicates zoom preview. Touch **Zoom** a second time to go into full zoom.

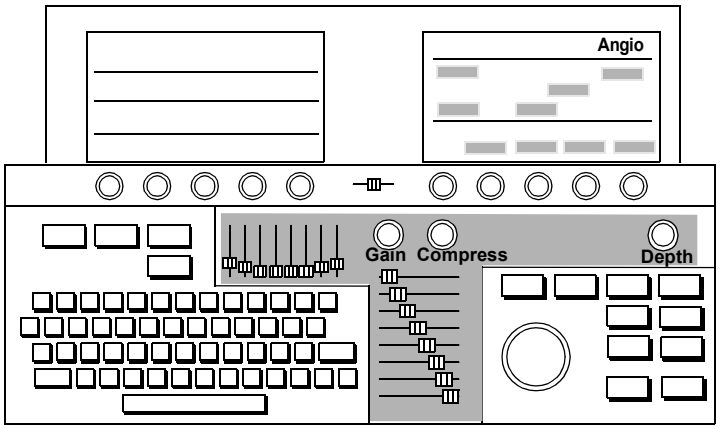
Secondary

Adaptive Angio	Changes the Angio frequency as a function of focal depth. When the Angio box is at the top (shallow depth), the highest frequency is displayed, and vice-versa.
Angio Priority	Displays all received Angio data by giving higher priority to Angio and overriding the BMode information.
Backgnd	Fills the entire color box with the lowest Angio flow velocity color.
Colorize	Optimizes contrast resolution by activating the current colorization map and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
LGCs	(Lateral Gain Controls) Each of the eight sliders adjusts the amplification of returning signals within a specific lateral 2D/BMode or AQ image area. Available only with sector and curvilinear array transducers.
LGC	Touch control that turns the Lateral Gain Controls on and off.
Magnify	Increases or decreases the magnification factor of an image in Zoom or Zoom Preview modes. Appears as a secondary control when **Contrast** is on.
Map	Changes the Angio flow map used for real-time and looping. Provides a selection for user preferences.
Packet	Selects Angio packet size: **S** (small), **M** (medium), or **L** (large).
Persist	Adjusts the amount of frame averaging, which can give a smoother appearance.
Power	Adjusts transmit power in decibels (dB) where 0.0dB = maximum power and -30.0dB = minimum power. Is a primary right-touch-panel control when **Contrast** is on.

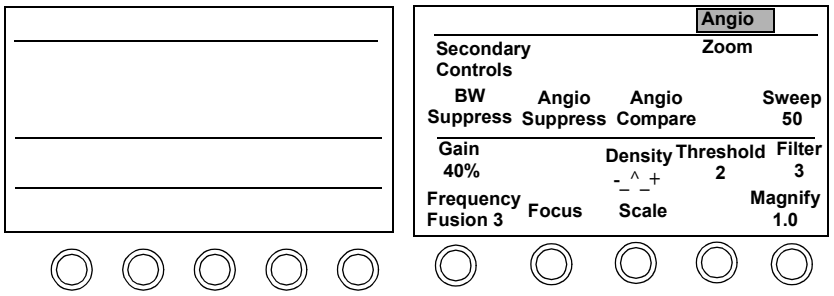
Secondary Controls	Switches between the primary and secondary touch panels. When the control is highlighted, the secondary controls are active.
Smoothing	Adjusts the amount of angio scan line averaging, affecting the smoothness and sensitivity of the angio display.
Trapezoid	Activates trapezoidal imaging, which widens the linear image to a trapezoid shape. Available only with transducers that offer this feature.

Using Angio Imaging

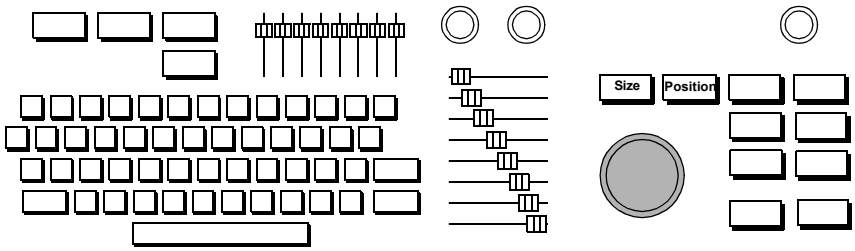
1. Optimize the 2D/BMode image using the keyboard imaging controls.



2. Touch **Angio**.

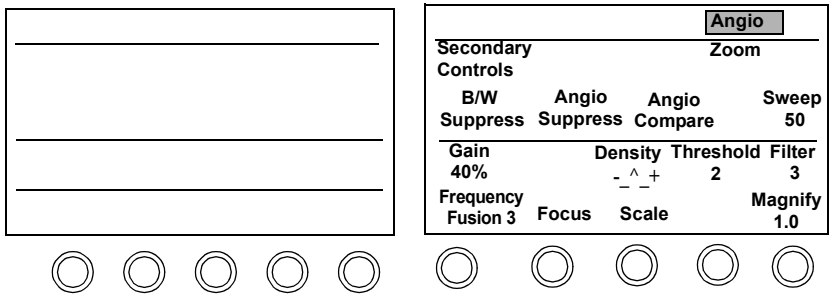


3. Adjust the location of the Angio area with the trackball. The **Position** key is active when you first enter Angio. To change the size of the Angio area, press **Size** and use the trackball.



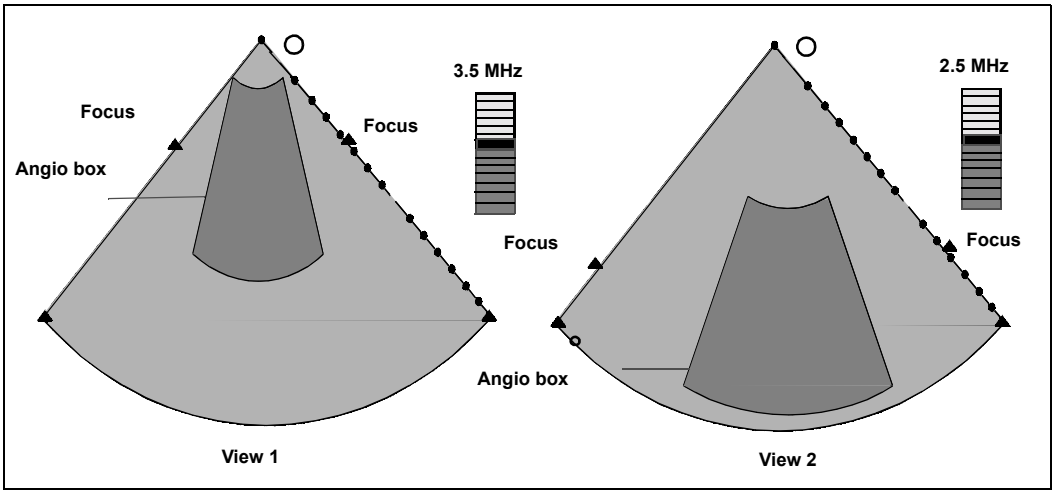
Tip: The Angio controls work the same as the color flow (**Map Invert** is not available in Angio).

4. Adjust **Gain.**



Adaptive Angio

Adaptive Angio provides the best angio sensitivity at every depth, while keeping the PRF (Pulse Rate Frequency) scale constant. The following illustration shows Adaptive Angio side-by-side images with the color box set to different depths:



Tip: The system automatically provides the optimal angio frequency and focus.

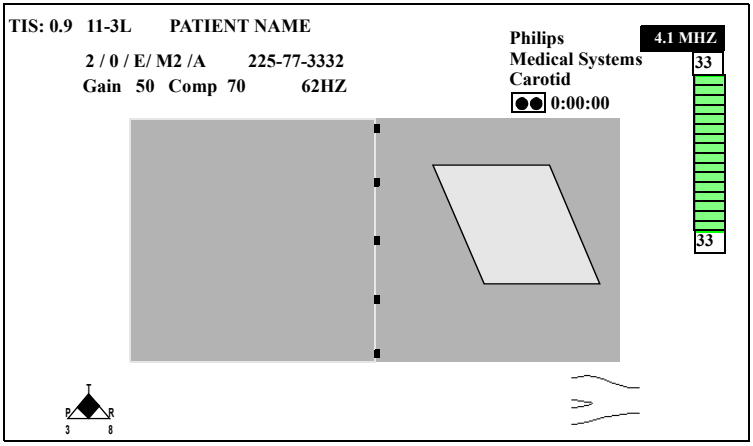
View 1 - Angio box at shallow depth
View 2 - Angio box at deeper depth

Following are some Adaptive Angio guidelines:

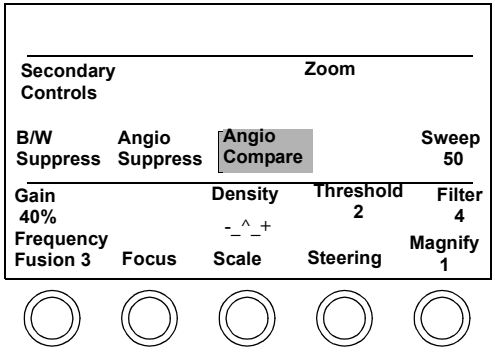
- As the angio box moves to the top of the sector (shallow depth), the system uses a higher angio frequency (View 1).
- When the angio box moves to the bottom of the sector, the system uses a lower angio frequency (View 2).
- The user may override the selected frequency by
  – moving the Focus control to a new depth in the angio box
  – disabling Adaptive Angio Frequency

Angio Compare

Angio Compare mode allows you to quickly compare a live Angio image with a grayscale version of the same image. The live Angio image is displayed on the right, and the grayscale version on the left, as illustrated in the following diagram:



1. While displaying a live Angio image, touch **Angio Compare**. The live Angio image appears next to a live black-and-white image.



2. To freeze both images, press **Freeze**.
3. To display both images side by side with color suppressed, touch **Angio Suppress**.
4. To turn off compare mode, touch **Angio Compare** again.

Angio Troubleshooting

Symptoms	Suggestions
Not sensitive.	**Scale**. Adjust **Angio Gain**; it could be too low. Adjust **Focus** to point at the area of interest. Choose a filter to reduce flash or improve sensitivity. Reposition the transducers, or try another imaging window. **Power**. Turn **Angio Priority** on for small vessels. Adjust **Smoothing**.
Need a higher frame rate.	Decrease the width of the Angio area by pressing **Size** and using the trackball. For sector or curvilinear array transducers, remove the grayscale image outside the color area by turning on **B/W Suppress**. **Density** **Packet** size **Scale**.

Symptoms	Suggestions
Need better Angio resolution.	Place transducer focus at location of interest with **Adaptive Angio** on. Vascular: With linear transducers, use **Steering** to achieve optimal Angio flow angles by steering the image to the right or left. Turn on **Angio Priority** to view small vessels. **Line Density**. For small vessels, Smoothing. **Packet** size. Go to highest frequency transducer possible.
Need better Angio filling.	**Angio Gain**. Adjust **Steering**. Adjust **Focus** with **Adaptive Angio** on. **Scale**. **Filter**. **Packet** size. Use **Smoothing** to attain the desired display appearance. Turn **Adaptive Angio** off for evaluating deep structures. For slow-moving blood or structures, **Persist**.

Symptoms	Suggestions
Cannot see slow moving velocities.	Adjust **Gain**. ↶ **Scale** to see more low-velocity blood flow information. ↶ **Filter**. ↶ **Persist**. Use **Steering** to make color as parallel to flow as possible. Adjust **Focus** to area of concern. ↶ **Threshold**. Turn **Angio Priority** on to display more color. Use full **Power** settings.
Angio image is noisy, flashing, or has artifacts.	↷ **Filter** setting to remove flash. ↷ **Angio Scale**. Adjust **Angio Gain**. ↷ **Threshold** to reject noise at lower levels. ↷ **Smoothing** to smooth the image. For slow-moving blood or structures, ↷ **Persist** to increase frame averaging. Narrow the color box to remove source of artifacts with **Size** control and the Trackball.
Angio images are printed on the wrong printer.	Press **Setup**, touch **Print**, and adjust **Color [printer]** to display the printer to use for color and angio images.

Tip: Mechanical heart valves occasionally cause unavoidable flashing artifact. Artifact could also be caused by external sources such as lighting, other equipment, or telecommunications devices.

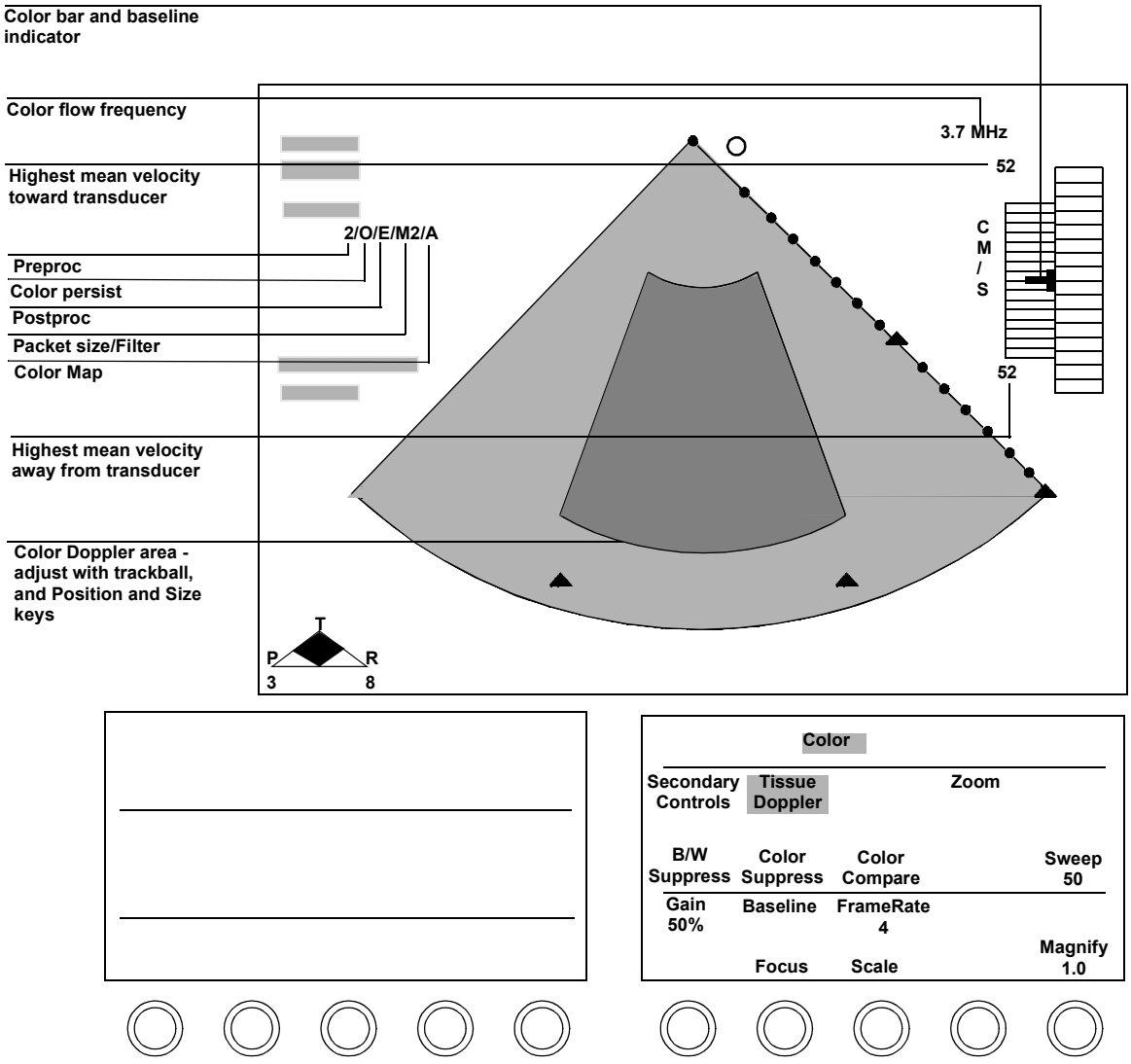
Tissue Doppler Imaging

Introduction

Tissue Doppler enhances image information by translating tissue movement and vascular flow velocities into color.

NOTE Tissue Doppler imaging is not available using a linear transducer.

Screen and Touch Panels (2D Tissue Doppler)



Using Tissue Doppler Imaging

The following section describes Tissue Doppler controls and how to use them. Note the following Doppler mode guidelines:

- Touching **PW** or **CW** turns on **Spectral**, unless depth marks are used.
- In **PW** nonspectral mode, pressing the Enter key automatically turns on **Spectral**.
- **Spectral** is available in **2D/BMode**, **Color**, and **Angio** when depth marks are used.
- In **Spectral**, pressing Enter turns on **BMode Live** (**2D-Live** if in Cardiac).
- When **PW** is turned on, the gate automatically moves away from the edge of the image.
- Touching **Cursor Angle** when highlighted sets the angle to zero, except when **Intelligent Doppler** is active or the image is frozen.
- In **PW Spectral**, you can display **Heart Rate** from a Doppler trace and make a measurement.

For more information on PW and CW modes, see "PW and CW Imaging" on page 7-79.

Depending on the imaging mode being used, the **Tissue Doppler** controls include

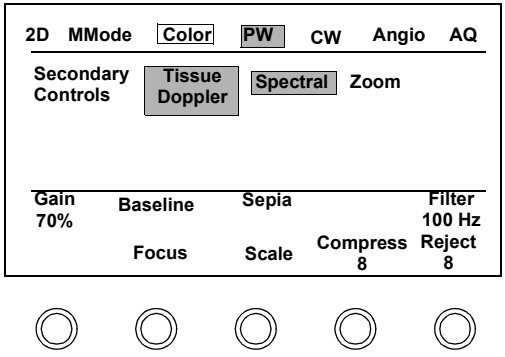
- **Color Gain**
- **Smoothing**
- **Color Map**
- **B/W Suppress**
- **PW Scale**
- **Reject**
- **Colorize**
- **Gate Length**
- **Compress**
- **Power**

These values can be adjusted and preset independently from the corresponding imaging control values outside of Tissue Doppler. Tissue Doppler is available on the s3, s4, s8, s12, and OmniPlane transducers and only in Cardiac presets. Tissue Doppler is not available when the image has been frozen using the **Freeze** key, and not in LVO or TCE contrast imaging modes.

There are three ways to use Tissue Doppler

- 2D Tissue Doppler:
  a. With a 2D image displayed, touch **Color** in the right touch panel.
  b. Touch **Tissue Doppler**.
- MMode Tissue Doppler:

  With an image displayed and **Tissue Doppler** highlighted, touch **MMode** in the right touch panel.
- Spectral Tissue Doppler:
  a. Using the trackball, move the cursor into position on a color-mode or a black-and-white 2D image.
  b. Touch **PW** in the right touch panel.
  c. Touch **Tissue Doppler**.in the right touch panel.



8 Annotation

Introduction

The SONOS system allows you to add text, notes, and labels to your exam images. This chapter provides information about

- Annotation screen and touch panels (page 8-2)
- Controls (page 8-3)
- Annotation procedure (page 8-4)
- Using body markers (page 8-13)

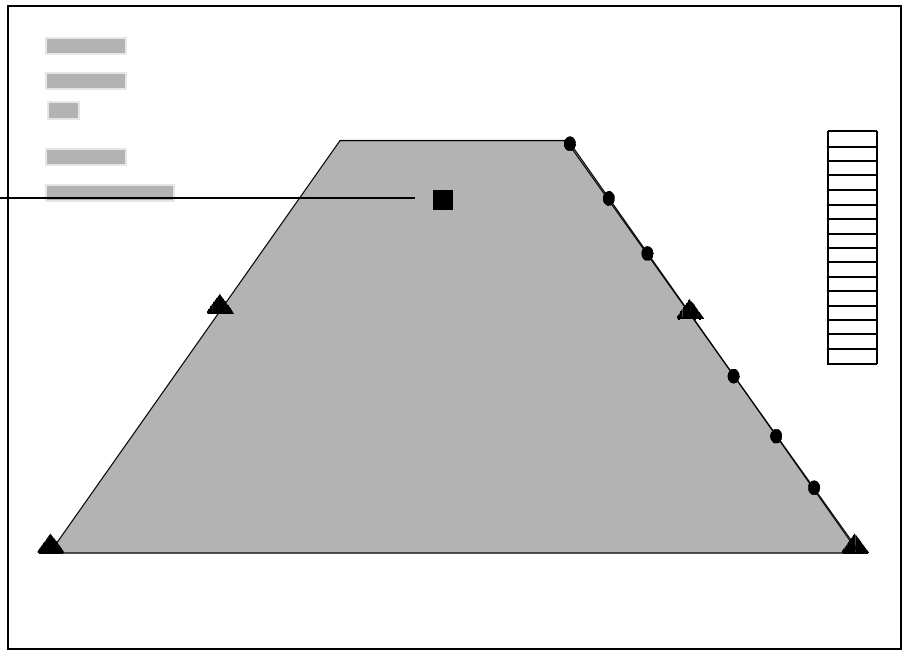
NOTE The annotation function is not available with Live-3D images.

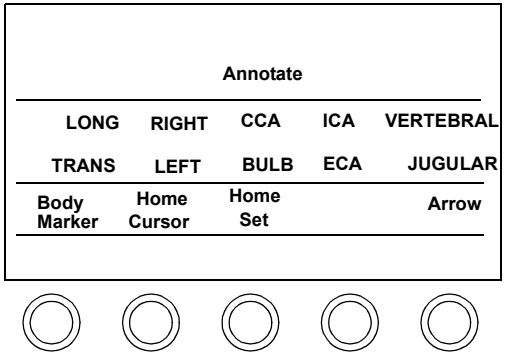
Screen and Touch Panels

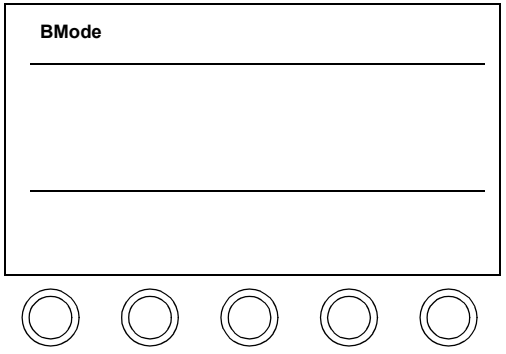
To change the cursor's home location, touch **Home Set**.

Annotation cursor – the label touched or letters typed appear here.

Active preset and mode determine labels shown – you can edit and store these.







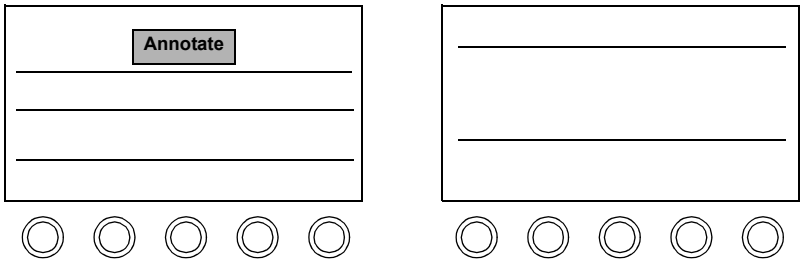
Controls

Arrow	Puts an arrow graphic on the screen at the current Annotation cursor location.
Body Marker	Enters or exits the Body Marker function. When activated, displays a body marker on the screen and allocates the body marker control on the annotation touch panel.
Clear All	Removes all Annotation arrows and text from the screen.
Erase Label	Removes selected (outlined) Annotation arrows and text from the screen.
Erase Marker	Erases the body marker and exits the Body Marker function.
Home Cursor	Moves the Annotation cursor to the location specified with **Home Set**.
Home Set	Establishes a new home location for the Annotation cursor.
Markers On/Off	Toggles the Body Marker function on or off.
Move	Moves and anchors selected (outlined) Annotation text and arrows.
Probe Size	Selects the transducer icon. The values are a large transducer, a small transducer, an arrow, and a dot.
Rotate Arrow	Rotates the Annotation arrow displayed. If more than one arrow is displayed, you can select the arrow to rotate with the trackball.
Rotate Probe	Rotates the active transducer icon. Twelve different angles are available, corresponding to the positions on a clock.

Annotation Procedure

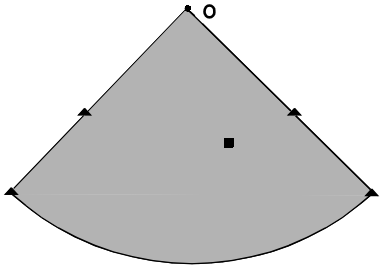
1. Touch **Annotate**. You can manually enter text whenever **Annotate** is active. To exit Annotation mode, touch **Annotate** again.

   The SONOS ultrasound system has a Quick Text feature that allows you to type text annotations starting from the Home location without pressing the **Annotate** touch control. For more information on Quick Text mode, see "Quick Text Mode" on page 8-12.

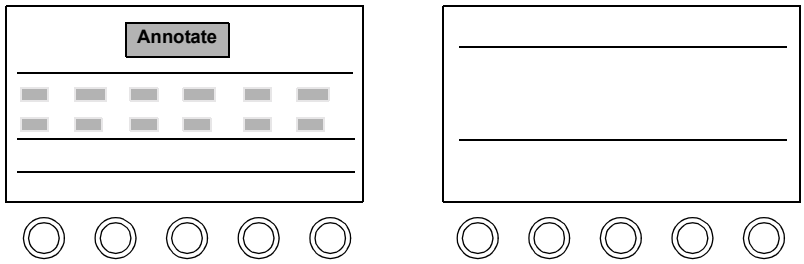


Tip: When **Annotate** is outlined instead of highlighted, you cannot use the trackball for Annotation. To return trackball control to Annotation, touch **Annotate**.

2. Use the trackball to place the Annotation cursor where you want to put a label.

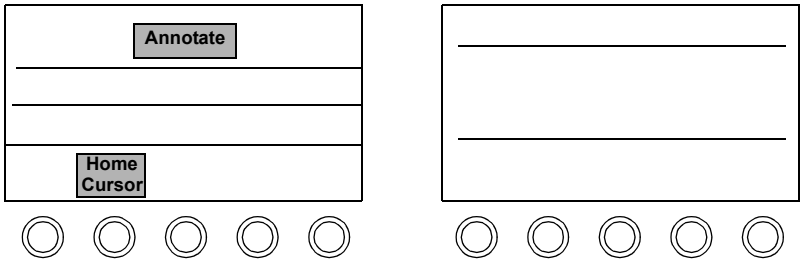


3. Touch the label you want, or type your own.

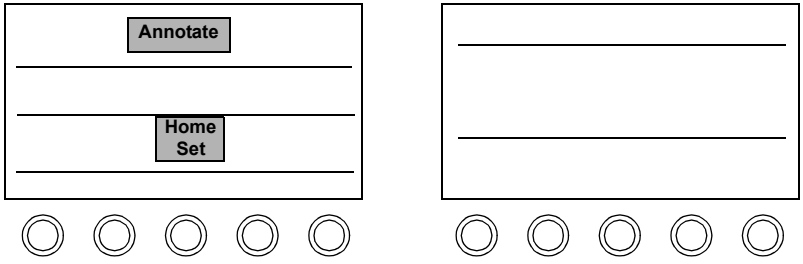


Changing the Home Cursor Location

1. Touch **Annotate** and position the Annotation cursor with the trackball. Put the cursor where you want to see it when you touch **Home Cursor**.

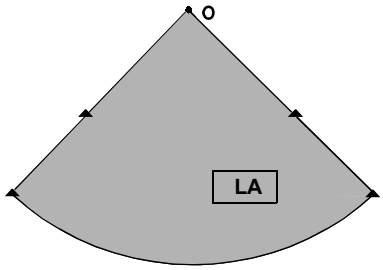


2. Touch **Home Set**.

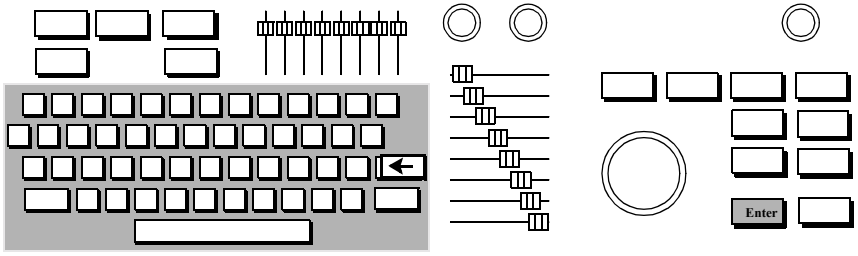


Editing Labels on the Screen

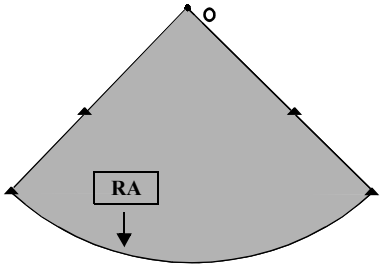
1. With **Annotate** active, use the trackball to select the label you want to change.



2. Type the new label and press Enter. If you make a mistake use ← to erase characters to the left of the cursor.

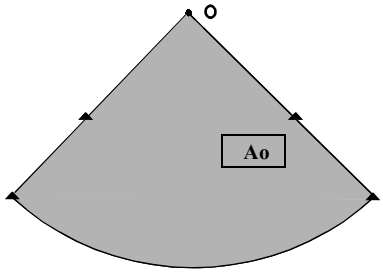


3. Edit additional labels, as needed. To put an arrow on the screen, place the Annotation cursor where you want the arrow. Touch **Arrow**, and if necessary, use the **Rotate Arrow** rotary control to change the orientation of the arrow.

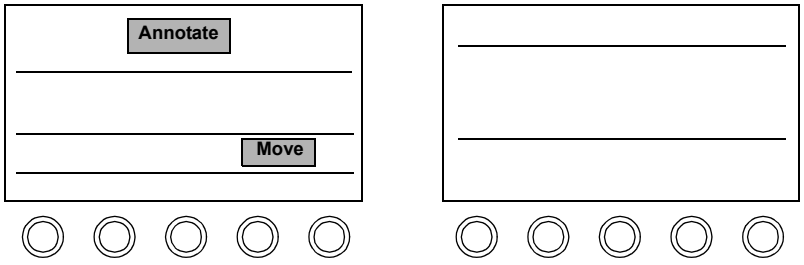


Moving Annotation Labels and Arrows

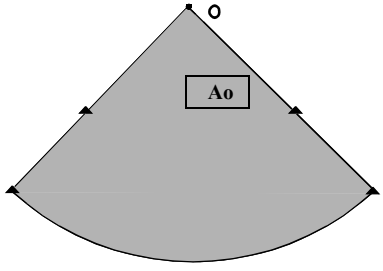
1. With **Annotate** active, use the trackball to select the label or arrow you want to move.



2. Touch **Move**.

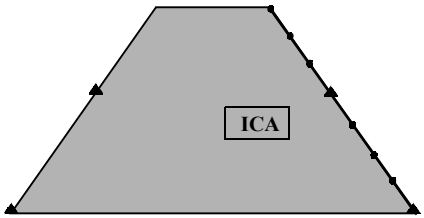


3. Reposition the label with the trackball, and press **Enter** to anchor it.

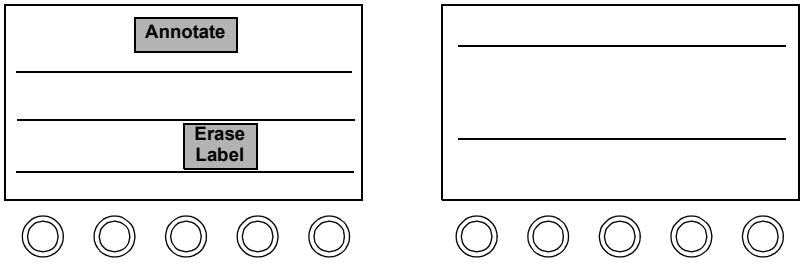


Erasing Annotation Labels and Arrows

1. With **Annotate** active, use the trackball to select what you want to delete. To delete all labels and arrows, press **Erase** or touch **Clear All.**

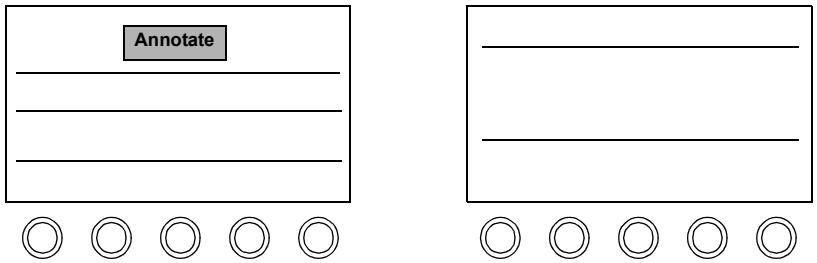


2. Touch **Erase Label**. To delete another label or arrow, repeat these steps.

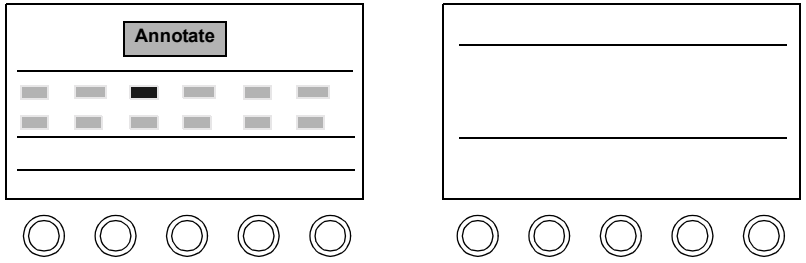


Editing the Annotation Touch Panel Labels

1. With **Annotate** active, press **Setup**.



2. Touch a label you want to edit. To remove a label, press **Erase**.

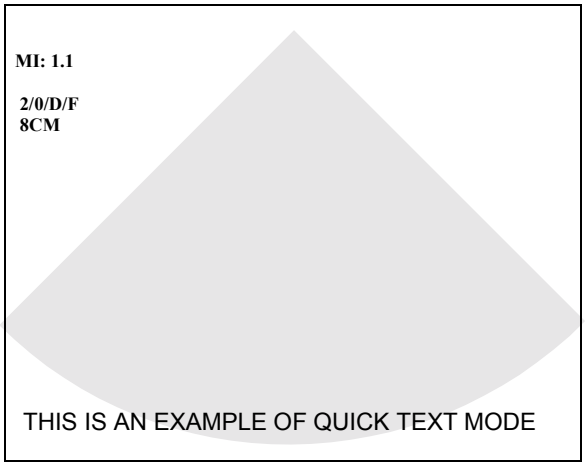


Tip: Hyphenate labels that do not fit on one line.

3. Type the new label, and select **Okay**.
4. Press **Setup** to exit Setup mode.
5. To keep your changes for future use, save them to a preset.

Quick Text Mode

Quick Text mode allows you to directly type a label from the Home position at any time, without entering Text Annotation mode. Quick Text mode is always active, except when you are using another application that requires the use of the keyboard, such as when you are entering patient ID information. The following figure shows a sample of Quick Text:



Using Quick Text

1. Use the keyboard to type a label to enter Quick Text mode.

2. Use the **Tab** key to jump from word to word when editing.

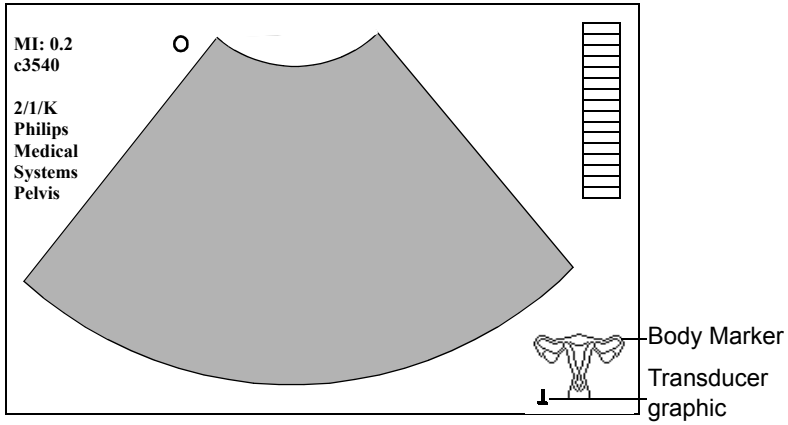
3. Press **Erase** when you want to erase all the text on the screen.

Tip: Pressing **Erase** while **Annotate** is off, removes all text unless a measurement is on the screen.

Using Body Markers

Your system allows you to display exam-appropriate body-marker icons on images and to indicate transducer positions.

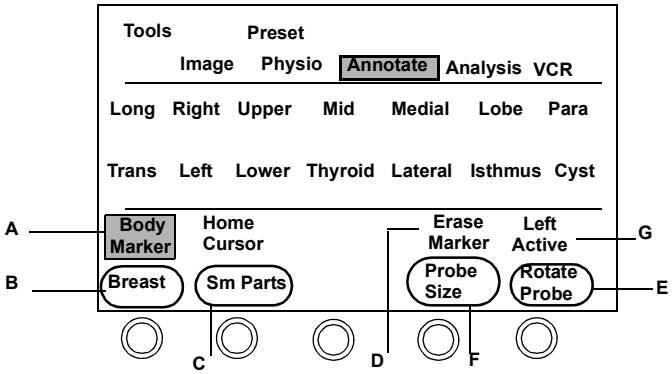
Body markers are available for all presets. The body marker normally is displayed in the bottom right corner of the image. A graphic representing the transducer can be positioned on top of the body marker. If Dual imaging mode is on, two body markers appear (one for each image). The following figure shows a sample body marker:



Controls

The following illustration shows the location of the individual body marker controls on the left touch panel:

A **Body Marker** on/off
B Select **Body Marker** rotary control
C Select **Small Parts** rotary control
D **Erase Marker**
E **Rotate Probe** rotary control
F **Probe Size** selection rotary control
G **Left Active/Right Active** control (Dual mode only)



Using Body Markers

1. Touch **Annotate** on the left touch panel.
2. Touch **Body Marker**.
3. Turn the marker-category rotary control (the second from left rotary control below the left touch panel) to choose the body marker category.
4. Turn the marker-selection rotary control (the far-left rotary control below the left touch panel) to select the body marker.
5. Turn the **Probe Size** rotary control to select the probe graphic you want to use.
6. Use the trackball to position the probe graphic on the body marker.
7. Use the **Rotate Probe** rotary control to angle the probe graphic as desired.
8. Do one of the following:
   - Touch **Erase Marker** to remove the current Body Marker icons from the screen.
   - Touch **Body Marker** or **Annotate** to exit Body Marker Annotation mode, while continuing to display the body markers.

In Dual Mode

Using the Body Marker function in Dual mode displays two body markers, one associated with each image. You can use the trackball and body marker controls to make only one body marker active at a time.

To display body markers in Dual mode:

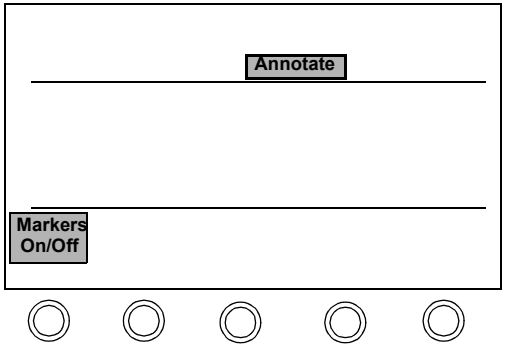
1. Touch **Annotate** in Dual imaging mode.
2. Touch **Body Marker**. Both body markers are displayed, but only one is active. The active image for annotation is indicated on the touch panel as **Left Active** or **Right Active**.
3. Touch the **Left Active/Right Active** control to select the image you want to make active and annotate.

4. Follow the directions under "Using Body Markers" on page 8-15 to specify the body marker for the active image.

Disabling/Enabling the Body Marker Function

You can disable or enable the Body Marker function through Annotation Setup.

1. Press **Setup**.
2. Touch **Annotate** on the left touch panel.
3. Touch **Markers On/Off** to disable or enable body markers.



9 Measurements

Introduction

The SONOS system allows you to extract a variety of physical measurements from live and videotaped exam images. This chapter provides information about

- Measurement screen and touch panels (page 9-1)
- Controls (page 9-2)
- Measurement setup (page 9-7)
- Online measurements (page 9-9)
- One-point depth measurements (page 9-19)
- Calibrating videotaped images for measurement (page 9-22)
- Measurement troubleshooting (page 9-24)

NOTE Measurements are not enabled on 3D renderings.

Screen and Touch Panels

The screens and touch-panel controls for each type of measurement are illustrated in the sections starting on page 9-9.

Controls

Cardiac Primary

The set of "Quick Calcs" and measurements available varies with measurement type, and the active imaging mode and preset.

Box Position	Changes the placement of the measurement box currently on the screen. **Box Position** is part of the **Image** control set (left touch panel). Appears only when a measurement is on the screen.
Caliper	Places a caliper (+) on the screen.
Enter	Completes the active measurement.
Erase	Removes measurements from the screen. If a trace is active, press Erase to back up and delete one dot at a time. To delete a series of trace dots, hold down Erase.
Freeze	Freezes and unfreezes the display. Press Freeze and use the trackball to scroll to the best measurement site.
Hide Box	Displays or hides the measurement box. **Hide Box** is part of the **Image** control set (left touch panel). Appears only when a measurement is on the screen.
Trace	Enables tracing on the screen.
Trackball	Positions calipers or traces areas on the screen.

Cardiac Setup

When you press Setup and touch **Measure**, the following controls appear on the right touch panel. Additionally, the Measurements Setup window appears on the imaging screen. This window is specific to the mode the system is in. See "Measurement Setup" on page 9-7 for more information.

Ellipse Trace	Enables area and circumference tracing by using the **Trace** key. Volume calculations cannot be obtained with this tracing method.
Manual Trace	Enables area and circumference manual tracing, which is needed for volume calculations. When **Manual Trace** is activated, the different methods of volume calculations, **Volume MOD** (Method of Discs), and **Volume SPE** (Single Plane Ellipse) are available.
M-Mode Ref Line	Provides a fixed, solid vertical line that helps you more accurately position calipers during MMode protocol measurements.

Noncardiac Primary

The set of "Quick Calcs" and measurements available varies with measurement type, and the active imaging mode and preset.

Box Position	Changes the placement of the measurement box currently on the screen. **Box Position** is part of the **Image** control set (left touch panel).
Caliper	Places a caliper (+) on the screen.
Enter	Completes the active measurement.
Erase	Removes measurements from the screen. If a trace is active, press Erase to back up and delete one dot at a time. To delete a series of trace dots, hold down Erase.
Freeze	Freezes and unfreezes the display. Press Freeze and use the trackball to scroll to the best measurement site.
Hide Box	Displays or hides the measurement box. **Hide Box** is part of the **Image** control set (left touch panel).

The **Meas Bar** controls are only available when you are doing an automatic Doppler trace. You must enable Doppler Trace by pressing Setup and touching **Doppler Trace** on the right touch panel. To activate the **Meas Bar** control, press Freeze and then Trace.

To do a manual Doppler trace, press Caliper and then Trace.

Meas Bar D (time)	Adjusts the position of the Measure Bar D time markers on a Doppler Trace. The Measure Bar D markers indicate the end-diastolic velocity and time points (D) that have been automatically chosen by the system.
Meas Bar D (vel)	Adjusts the position of the Measure Bar D velocity markers on a Doppler Trace. The Measure Bar D markers indicate the end-diastolic velocity and time points (D) that have been automatically chosen by the system.

Meas Bar S (time)	Adjusts the position of the Measure Bar S time markers on a Doppler Trace. The Measure Bar S markers indicate the systolic velocity and time points (S) that have been automatically chosen by the system.
Meas Bar S (vel)	Adjusts the position of the Measure Bar S velocity markers on a Doppler Trace. The Measure Bar S markers indicate the systolic velocity and time points (S) that have been automatically chosen by the system.
Meas Bar S1 (time)	Adjusts the position of the Measure Bar S1 time markers on an automatically selected and traced spectral segment. The Measure Bar S1 markers indicate the systolic point of the next complex in the automatically traced spectral segment.
Meas Bar S1 (vel)	Adjusts the position of the Measure Bar S1 velocity markers on an automatically selected and traced spectral segment. The Measure Bar S1 markers indicate the systolic point of the next complex in the automatically traced spectral segment.
Trace	Enables tracing on the screen.
Trackball	Positions calipers or traces areas on the screen.

Noncardiac Setup

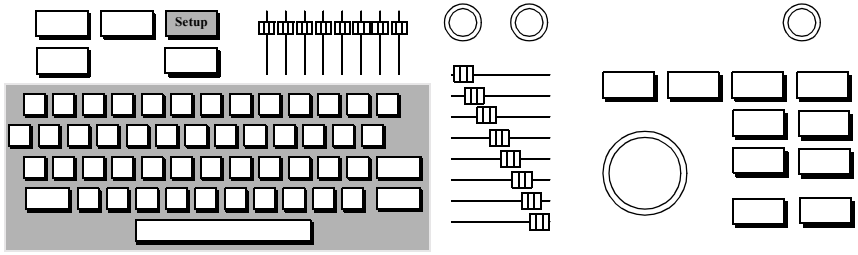
When you press **Setup** and touch **Measure**, the following controls appear on the right touch panel. Additionally, the Measurements Setup window appears on the screen. This window is specific to the mode the system is in. See "Measurement Setup" on page 9-7 for more information.

Doppler Trace	Enables automatic tracing of a frozen Doppler spectrum.
Ellipse Trace	Enables area and circumference tracing by using the **Trace** key. Volume calculations cannot be obtained with this tracing method.
Manual Trace	Enables area and circumference manual tracing that is needed for volume calculations.
M-Mode Ref Line	Provides a fixed, solid vertical line that helps you more accurately position calipers during MMode protocol measurements.

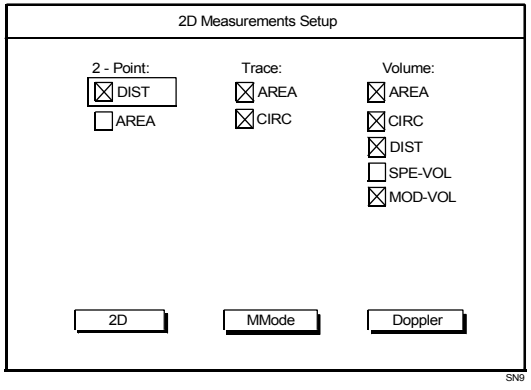
Measurement Setup

You can set up the measurements you want for each mode through the Measurements Setup window. You can then save the measurement configuration to a preset.

1. Press **Setup** to enter Setup mode.



2. Touch **Measure** on the right touch panel. The Measurements Setup window for the mode you are in appears. (The following illustration shows an example of a 2D Measurements Setup window.)

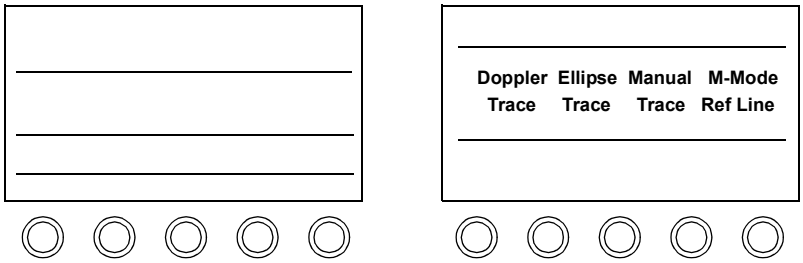


Tip: If you want to keep the changes, make sure that you save them to a preset.

3. Use the trackball to highlight the measurements you want and press **Enter**. You must check at least one box under each heading. The measurements you select appear in the measurement box on the imaging screen when you are performing the measurements.

   To see the Measurements Setup window for another mode, highlight the mode and press **Enter**.

4. To enable **Doppler Trace**, (vascular, abdominal, and OB/GYN presets) **Ellipse Trace**, or **Manual Trace**, touch the appropriate control on the right touch panel. Press **Setup** when you are done with your changes.

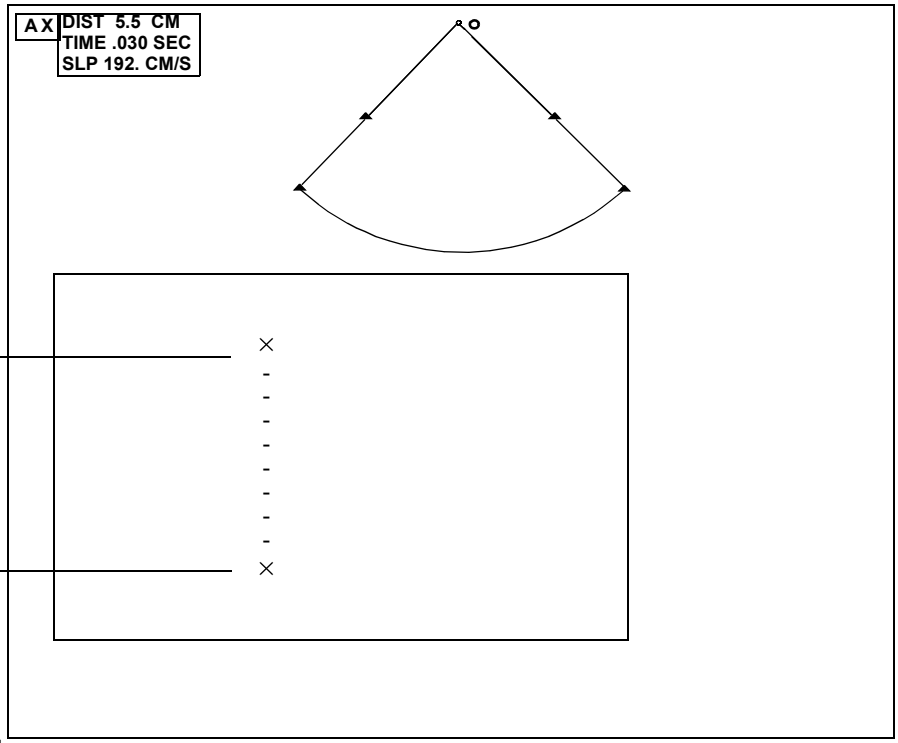


Online Measurements

The SONOS system allows you to perform for following online measurements:

- MMode or 2D/BMode (page 9-10)
- 2D/BMode trace (page 9-12)
- LV volume (page 9-13)
- Doppler velocity (page 9-14)
- Manual Doppler trace (page 9-15)
- Doppler auto trace (noncardiac presets) (page 9-16)
- Doppler trace (noncardiac presets) (page 9-18)

MMode or 2D/BMode Linear Measurements



1. Press **Freeze**, scroll to the appropriate area, and press **Caliper**.

2. Position the starting point with trackball, and press **Caliper**.

3. Position the end point with trackball, and press **Enter**.

4. To perform additional measurements (up to four per screen), press **Caliper** and repeat steps 2 and 3.

The MMode Reference Line

The MMode reference line is a fixed, solid vertical line that helps you more accurately position calipers during MMode protocol measurements. When displayed, this line can be aligned with the ECG. It is locked in the vertical plane, and calipers can not be moved left or right of the line.

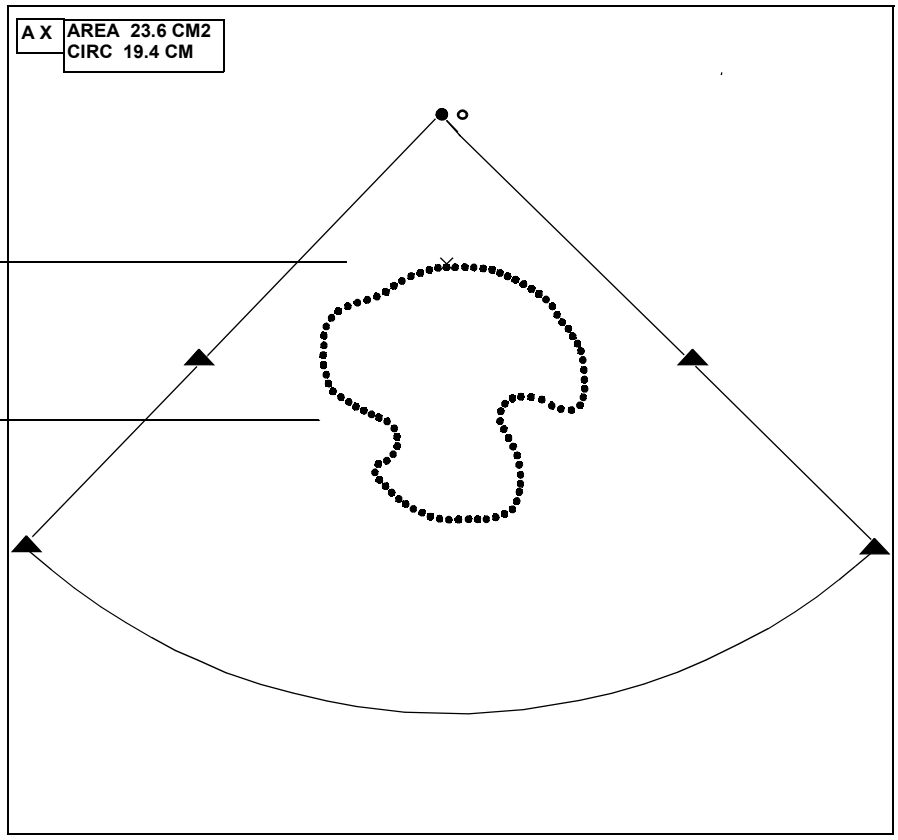
To enable the MMode reference line:

1. Press **Setup**.
2. Touch **Measure**.
3. Touch **MMode Ref Line**.
4. Press **Setup** to exit.

To use the MMode reference line:

1. Press **Caliper**.
2. Move the MMode reference line until it marks the point on the ECG where you want to make measurements.
3. Make MMode measurements along the reference line.

2D/BMode Trace Measurements



1. Press **Freeze**, and press **Trace**.

2. Position the starting point with trackball, and press **Trace**.

3. Trace the area to measure with the trackball, and press **Enter**.

4. To perform additional measurements (up to four per screen), press **Trace** and repeat steps 2 and 3.

If you stop moving the caliper before finishing the trace, the system closes the trace from the caliper's position to the first dot, and the measurement values are automatically displayed. If you complete the trace manually, the new values also display.

Erase deletes individual trace points during an active trace, or all measurement text and graphics for completed measurements.

LV Volume Measurements

1. Press **Freeze**.

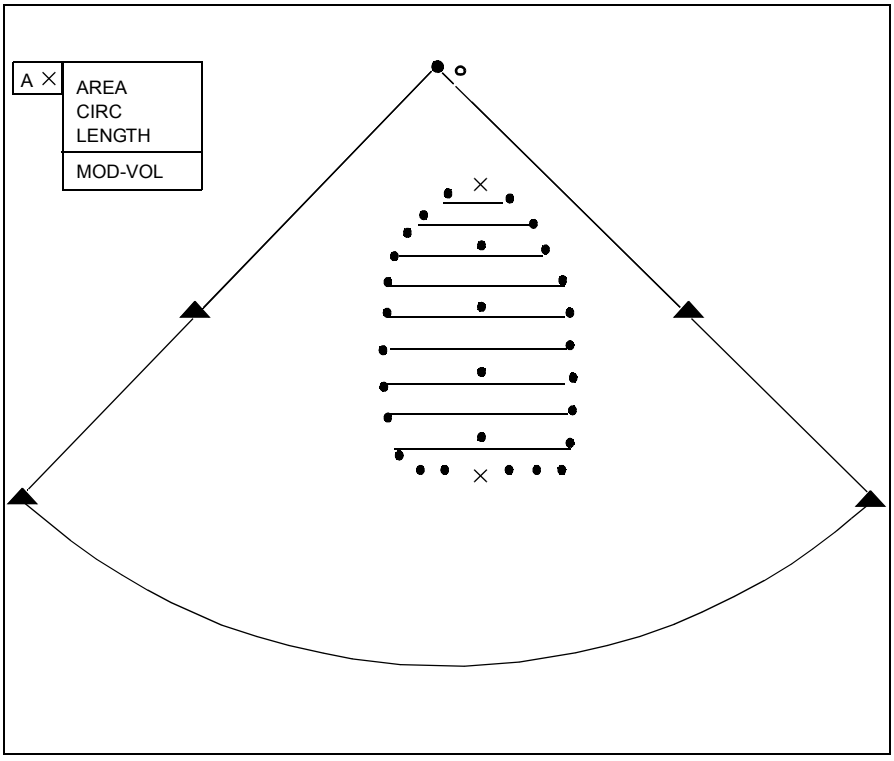
2. Press **Trace** and place the caliper at the MV annulus.

3. Press **Trace**, outline the endocardium area to other MV annulus with the trackball, and press **Caliper**. (The line will automatically close, giving you a better long axis.)

To change the long axis, reposition the caliper and press **Enter**.

4. To confirm line automatically drawn, press **Enter**.

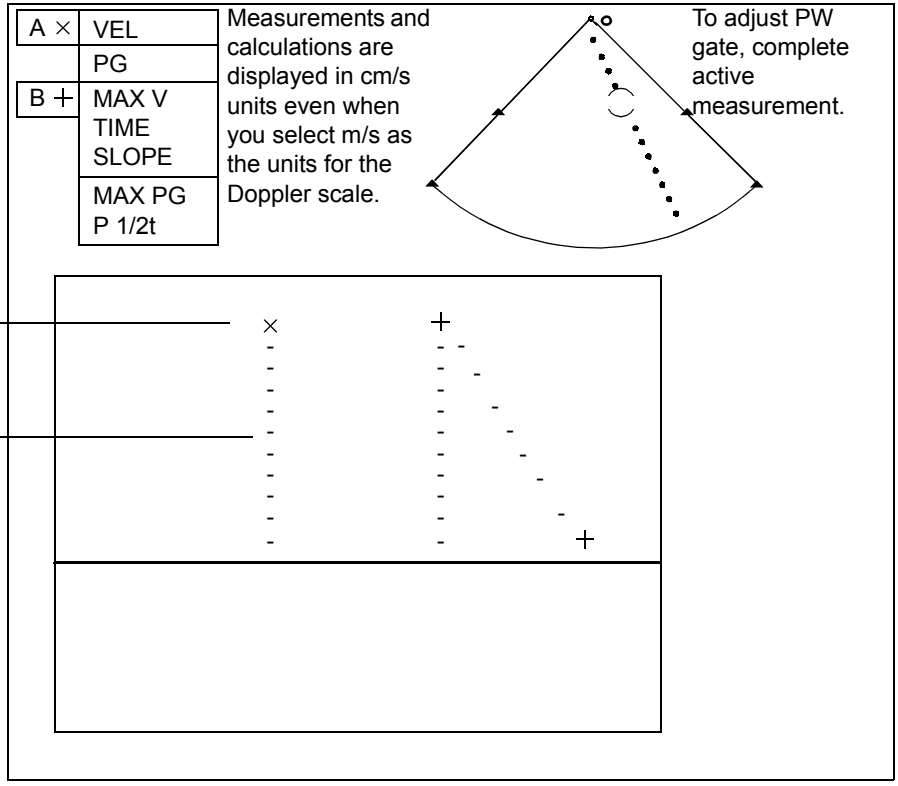
To use **Single Plane Ellipse**, see **Volume SPE** in the Control Summary.



If you stop moving the caliper before finishing the trace, the system closes the trace from the caliper's position to the first dot, and the measurement values are automatically displayed. If you complete the trace manually, the new values also display.

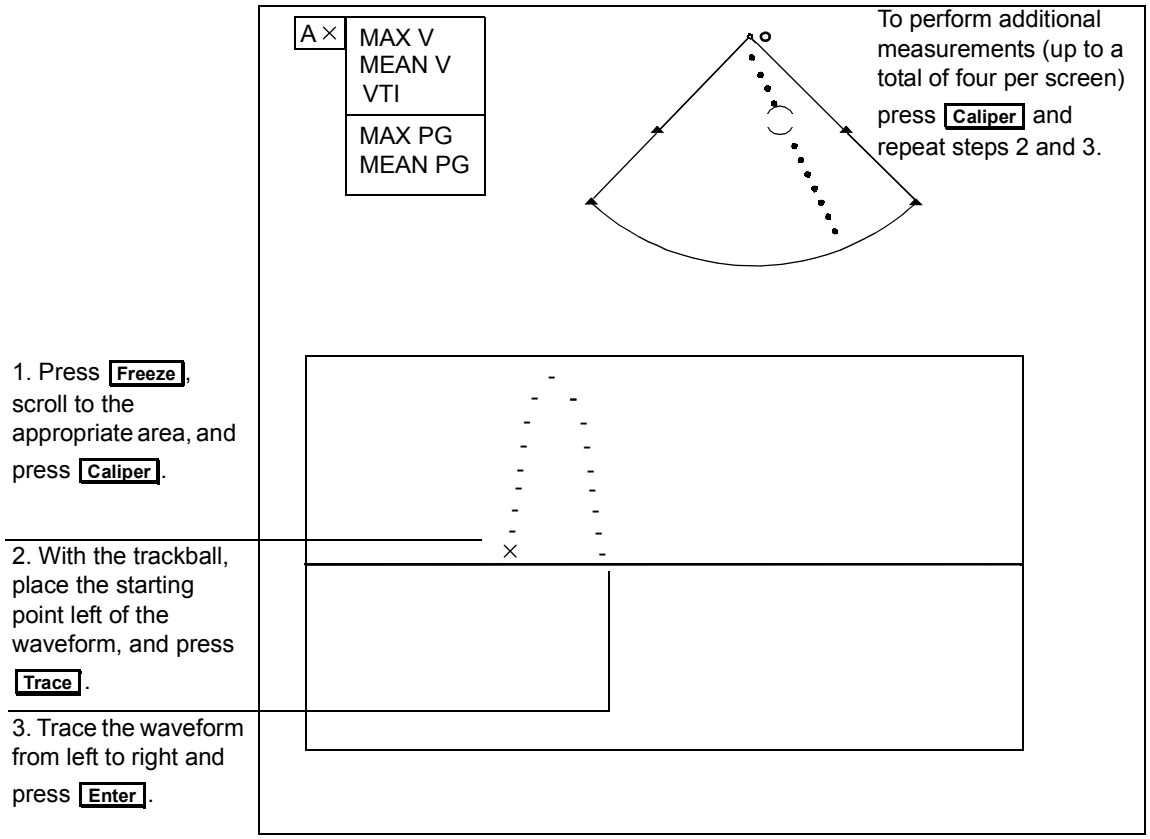
Erase deletes individual trace points during an active trace, or all measurement text and graphics for completed measurements.

Doppler Velocity Measurements


A ×
VEL
PG
B +
MAX V
TIME
SLOPE
MAX PG
P 1/2t
Measurements and calculations are displayed in cm/s units even when you select m/s as the units for the Doppler scale.
To adjust PW gate, complete active measurement.
1. Press Freeze, scroll to the appropriate area, and press Caliper.
2. Position the caliper with the trackball.
3. For velocity, press Enter.
4. For two-point measurements, press Caliper, put a caliper at the second point, and press Enter.
5. To perform additional measurements (up to a total of four per screen), press Caliper and repeat step 2.

The active preset determines the available measurements.

Manual Doppler Trace Measurements


A ×
MAX V
MEAN V
VTI
MAX PG
MEAN PG
To perform additional measurements (up to a total of four per screen) press Caliper and repeat steps 2 and 3.
1. Press Freeze, scroll to the appropriate area, and press Caliper.
2. With the trackball, place the starting point left of the waveform, and press Trace.
3. Trace the waveform from left to right and press Enter.

The active preset determines which measurements are available.

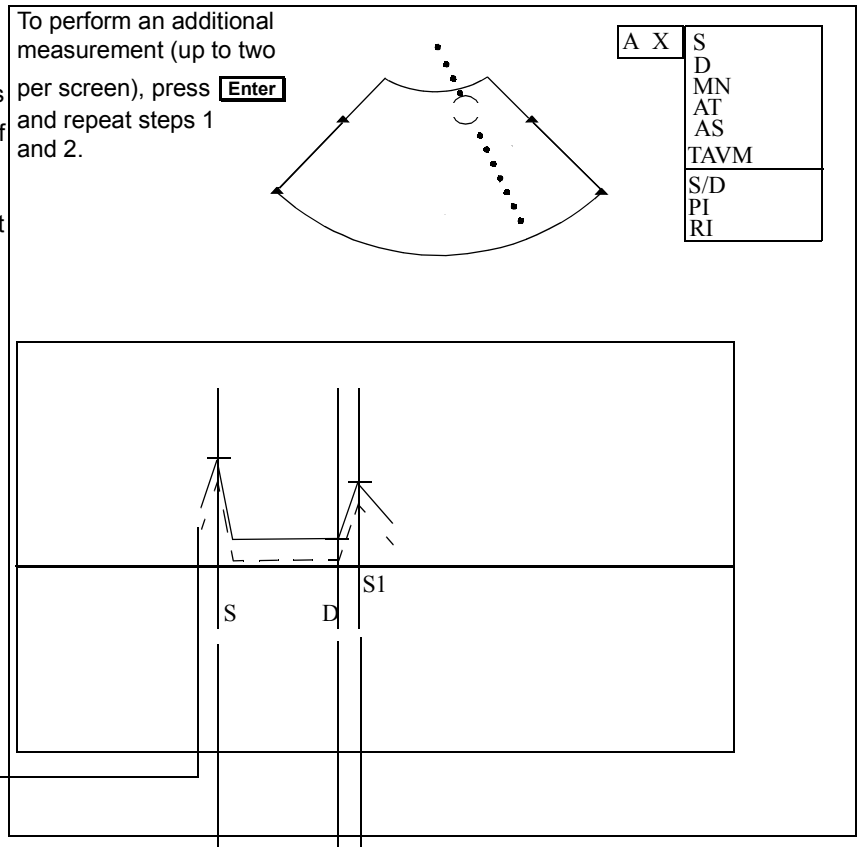
If a vascular, OB/GYN, or abdominal preset is active and **Doppler Trace** is on in Measurements Setup, the system can trace a portion of the spectrum you mark. Press Trace, position a caliper on the left side of the waveform, position a caliper on the right side of the waveform, and press Enter.

Doppler Auto Trace Measurements (Noncardiac Presets)

In this example **Doppler Trace** is turned on in Measurements Setup.

1. Press **Freeze**, and press **Trace**. Adjust **Threshold** if necessary to perform an accurate trace. Note that **Waveform Suppress** must be off to activate the blue trace line as a visual feedback for **Threshold** control. The system automatically traces a waveform and displays measurements and calculations according to the selected preset.

2. If necessary, use the **Meas Bar** time and velocity controls on the right touch panel and the related rotary controls to reposition any measurement bar on the traced segment.



The dotted line below the trace displays the mean velocity flow.

S marks the highest point detected by the system in the selected complex.

D marks the end-diastolic point.

S1 marks the highest point in the next complex.

Tip: With a manual trace, up to three additional measurements can be made per screen.

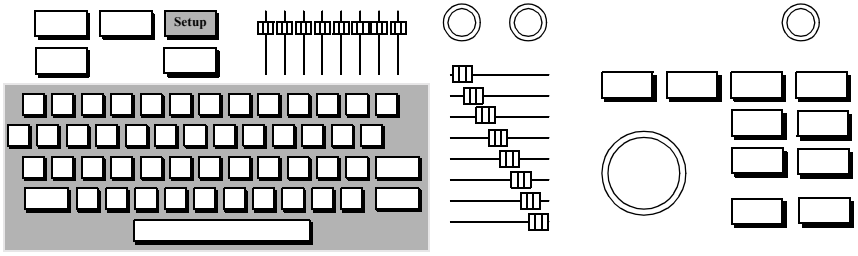
To manually trace a portion of a frozen spectrum, press **Freeze**, then **Caliper**, and use the trackball to place the starting point to the left of the waveform. Press **Trace** and use the trackball to outline the waveform. Press **Enter** to complete the process.

Doppler Trace Measurements (Noncardiac Presets)

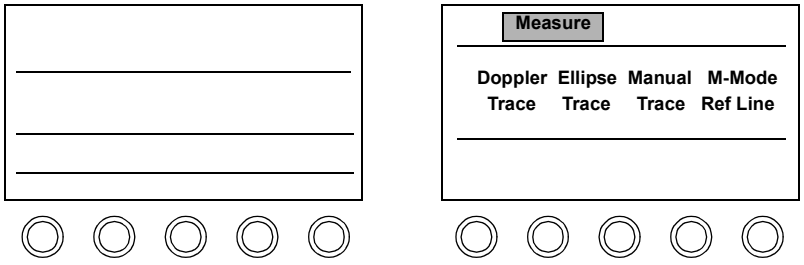
This section describes how to use Doppler Trace, a system function that speeds up your exam by automatically tracing the frozen spectral Doppler display, calculating key measurements, and displaying all information you need.

The SONOS system uses the end-diastolic velocity for the pulsatility index (PI) and resistivity index (RI) calculations. Some members of the medical community recommend calculating PI and RI from the minimum diastolic velocity, which may not be at end diastole. See the *Measurements and Calculations Reference* for more information.

1. Press **Setup** to enter Setup mode.



2. Touch **Measure** and **Doppler Trace** to disable Doppler Trace functions.



One-Point Depth Measurement

When you are scanning in BMode using a noncardiac preset, one-point depth measurement permits you to measure the depth of a caliper from the top of an image by pressing the Caliper key.

Depth is calculated from the apex of the image to the center of the crosshair for sector probes, and from the transducer-edge of the image to the center of the crosshair for linear and curvilinear probes.

Pressing Enter while the crosshair is active displays the current measurement in the results box as a 2D/BMode one-point measurement.

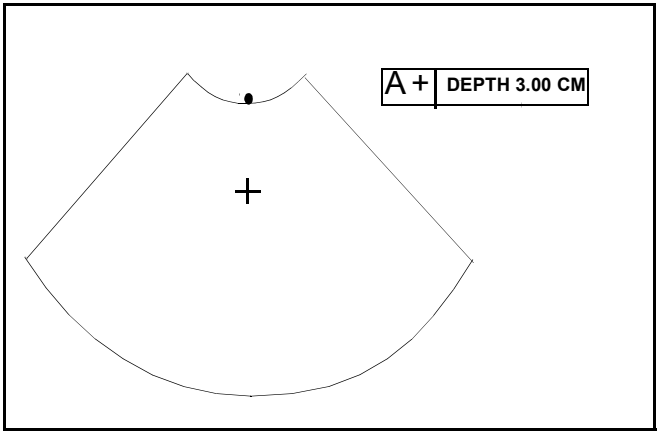
Once you enter Analysis mode, the one-point depth measurement is unavailable.

In a trapezoidal image, one-point depths are measured:

- From the caliper along the steering angle to the skin line (depth=0) for caliper points in the linear part of the image
- From the caliper to the skin line radially towards the origin of the sector in the left-sector and right-sector parts of the image

Making a One-point Depth Measurement

To make a one-point depth measurement press Caliper. The caliper is displayed on the imaging screen, and the depth measurement in a results box.



Making Angle Measurements in the OB Preset

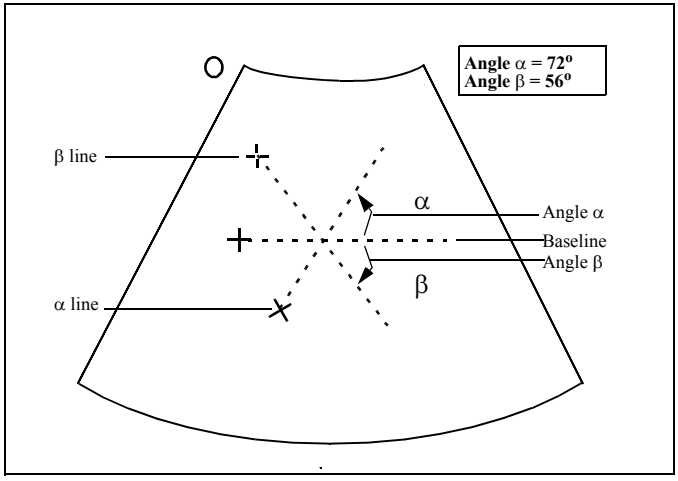
To make an angle measurement in the OB preset:

1. Touch **OB/GYN Exam** on the left touch panel.
2. Touch **OB** preset.
3. Touch **Analysis**.
4. Touch **Limbs**.
5. Touch **Angle**.
6. Touch **Baseline**.
7. Use the trackball to position the free crosshair that appears, and then press Caliper to anchor the crosshair and get a second free crosshair.
8. Use the trackball to move the second crosshair to create and position a line. Press Enter to confirm.

9. Touch **α Line** to get a new crosshair, and repeat steps 7 and 8 to position and approve the α line.

10. To establish another angle, touch **β Line** to get a new crosshair, and repeat steps 7 and 8 to position and approve the β line.

Your alpha (α) and beta (β) angle measurements are displayed in a box at the top right of the screen and on the report, as shown in the illustration.



Calibrating Videotaped Images for Measurement

These steps pertain to any images that have been videotaped, even if you are viewing those images in Loop mode or Disk mode.

1. Press Freeze.
2. Press Caliper.
3. Use the trackball to select the mode, and then press Enter.
4. Place the measurement caliper on a marker according to the mode, as indicated on the screen, and then press Enter.
5. Move the caliper to another marker of the same kind. Place the second caliper as far away as possible from the first marker, and then press Enter.

NOTE

For time measurements, be sure the second caliper is to the **right** of the first caliper. If it is not, the calculated mean values will be incorrect.

When reviewing the results of measurements made from videotape, if the maximum and mean gradients are the same value, the calibration was done incorrectly. Recalibrate the image as described in this section.

6. Enter the corresponding value indicated between the two points, and then press Enter. Follow any additional instructions that are displayed for this mode.

NOTE

When entering Doppler values, it is important to be sensitive to numeric signs. When entering a velocity value, if the value is negative, be sure to enter a negative sign with the value.

7. When you finish a measurement, press Enter. The system displays a "Calibration complete" message.

8. To perform additional measurements of the same type on the same frozen image, press Caliper, highlight **Same Cal**, and press Enter. To use this method for loops, you must be making measurements on the same loop.

9. If the measurement parameters are different, or to perform a different type of measurement, repeat the above steps, starting with Step 2.

Measurement Troubleshooting

Be sure to calibrate any images that have been videotaped (or were stored with older systems), even if you are viewing those images in Loop or Disk, before making measurements.

Symptoms	Suggestions
Cannot erase a measurement.	Linear measurements: Press Erase once to remove a completed measurement; for incomplete measurements, press Erase twice. Trace measurements: Press and hold Erase to remove dots. Press Erase again to remove the caliper.
The measurements box does not update during scrolling.	This can happen if the position of the Doppler line, the size of the PW gate, or the cursor angle changed.
Loop measurements disappear.	When you make measurements on loops acquired from videotape, measurements on loops acquired from real-time imaging are erased.

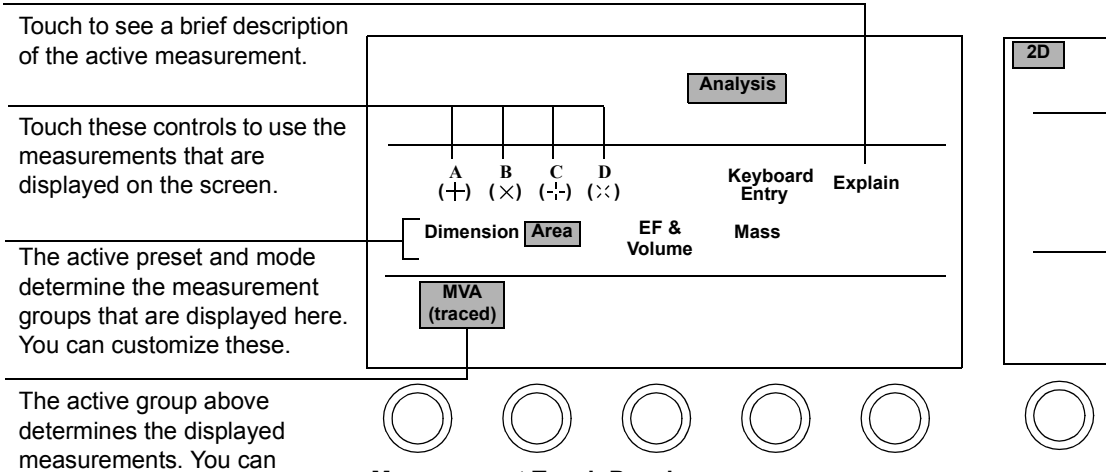
10 Analysis

Introduction

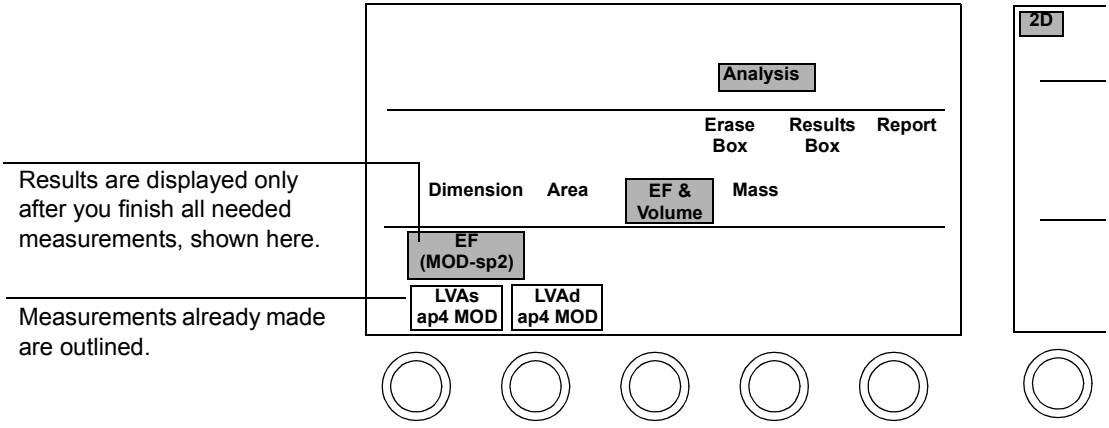
The SONOS system allows you to perform a variety of computations using your exam measurements. This chapter provides information about

- Analysis screen and touch panels (page 10-2)
- Controls (page 10-3)
- Customizing analysis touch controls (page 10-7)
- Analysis procedure (page 10-10)
- OB growth curves (page 10-13)
- Analysis troubleshooting (page 10-17)

Screen and Touch Panels


Touch to see a brief description of the active measurement.
Touch these controls to use the measurements that are displayed on the screen.
The active preset and mode determine the measurement groups that are displayed here. You can customize these.
The active group above determines the displayed measurements. You can customize this.
Analysis
2D
A
B
C
D
Keyboard Entry
Explain
Dimension
Area
EF & Volume
Mass
MVA (traced)

Measurement Touch Panel



Calculation Touch Panel

Controls

Primary

Tip: The *Measurements and Calculations* training toolkit contains details on Analysis use and customization.

Erase Box	Clears all entries from the results box. Available only when no measurement is active.
Explain	Briefly describes the active measurement in a window on the screen.
Keyboard Entry	Lets you enter data for any active measurement, except an MOD (Method of Discs) measurement.
Left	Selects measurements and calculations to be made for the left side of the body.
Mid/Main	Selects the report for the mid-region of the body, when performing bilateral studies, such as carotid or extremity exams. Available only with vascular, abdominal, or OB/GYN presets.
Report	Displays the Analysis report page on the screen, showing all measurements and calculations completed for the current patient. The touch controls change to pertain to the report page (whose controls are described below). Available only when no measurement is active.
Results Box	Continuously displays the most recently completed measurement or calculation value on the screen. When **Results Box** is off, this information is displayed for five seconds after each completed measurement or calculation. Available only when no measurement is active.
Right	Selects measurements and calculations to be made for the right side of the body.

Reports

When **Report** is active, controls showing report types based on the active mode and preset, appear. Touch a report type to view it.

Acquire Report	Captures the displayed report onto a page in loop memory.
Analysis Report	Indicates that a report page is displayed on the right touch panel. Touching **Analysis Report** returns the system to the previous imaging mode.
Clear Field	Deletes information in the current field. Available only when **Edit Data** is on.
Edit Data	Enables editing of report data, using the trackball and keyboard. If the information entered affects other calculations, they are updated. An asterisk (*) indicates an edited value, or a calculation that used an edited value.
Erase All	Deletes all report data for this patient.
Left	Selects the report for the left side of the body when performing bilateral studies such as carotid or extremity exams. Available only with vascular, abdominal, or OB/GYN presets.
Long Format	Displays a report showing all measurements and calculations that are active in Setup for this preset.
Mid/Main	Selects the report for the mid-region of the body, when performing bilateral studies such as carotid or extremity exams. Available only with vascular, abdominal, or OB/GYN presets.
Next Page	Displays the next page of the report, for reports longer than one page.
Prev Page	Displays the previous page of the report, for reports longer than one page.

Right	Selects the report for the right side of the body, when performing bilateral studies. Available only with vascular, abdominal, or OB/GYN presets.
Serial Output	Connects to a separate serial printer.
Short Format	Displays a report showing only measurements and calculations that are active in Setup and that contain data.

Setup

Of groups

With **Analysis** and the appropriate preset active, press **Setup**. Use the trackball and **Enter** key to highlight and confirm the choices that appear on the Analysis Setup window.

Copy	Adds a copy of the currently highlighted group to the touch panel. You can then rename that group and edit the measurements and calculations in it.
Create	Creates a new, empty group that does not contain any measurements or calculations. Use **Edit** (in the Meas/Calc section of the Analysis Setup window) to select the measurements and calculations to include with this group.
Delete	Removes a group and the measurements and calculations within that group from the touch panel.
Rename	Lets you enter a new name for a group on the touch panel.

Of measurements and calculations

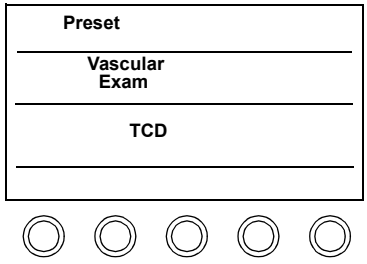
Edit	Lets you add, delete, or move measurements or calculations that are part of the active group.
Multiple Delete	Removes multiple measurements and calculations at one time.

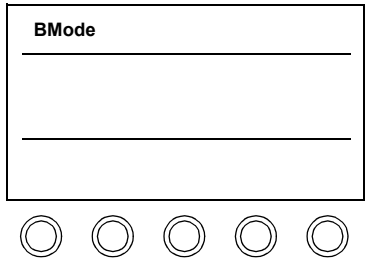
Of reports

English/Metric	Sets the units to be used for body surface area (inches and pounds, or centimeters and kilograms).
Weight Percentiles	Enables or disables the use of weight percentile growth tables with the OB/GYN presets.

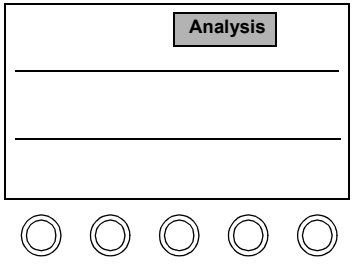
Customizing Analysis Touch Controls

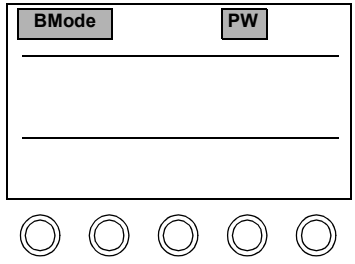
1. Make sure the active preset and mode are appropriate for the changes you want to make. Analysis touch controls are preset and mode dependent.



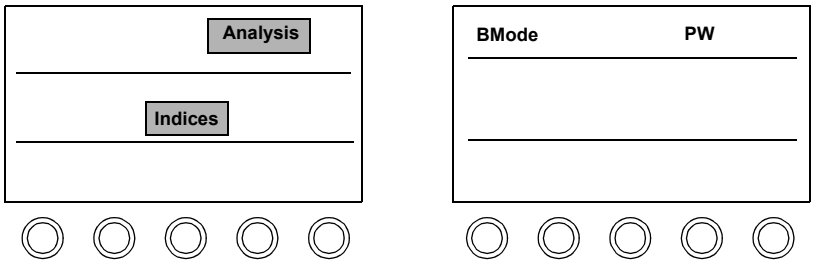


2. Touch **Analysis** and press Setup.

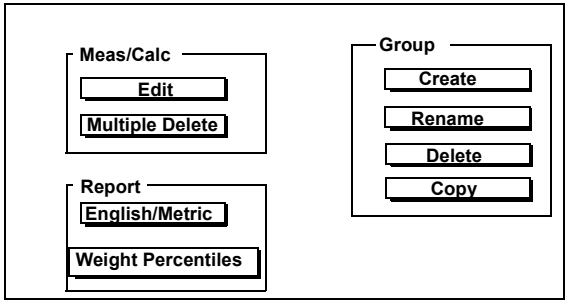




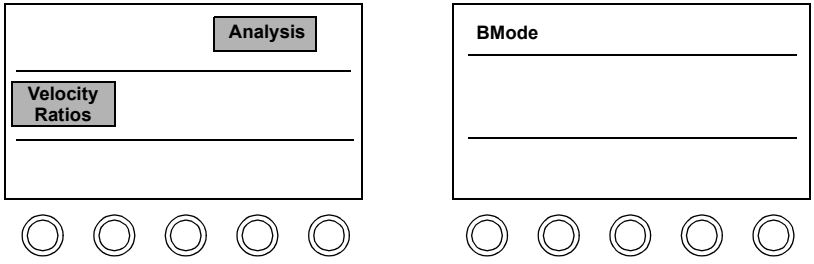
3. Touch the group you want to customize.



4. Highlight the task you want to do with the trackball and press **Enter**. Follow the instructions on the screen.



5. To customize another group, touch it and repeat the previous step.

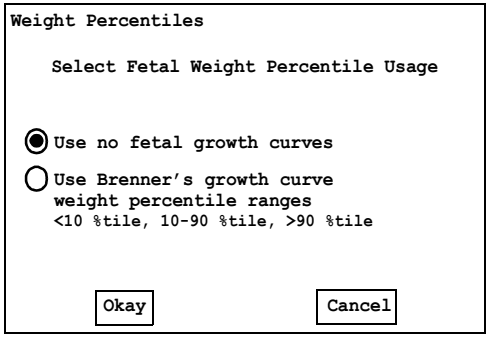


Tip: To make these changes permanent, save them to a preset.

6. When you are done, press **Setup** to leave Setup.

Configuring Weight Percentiles Report Display

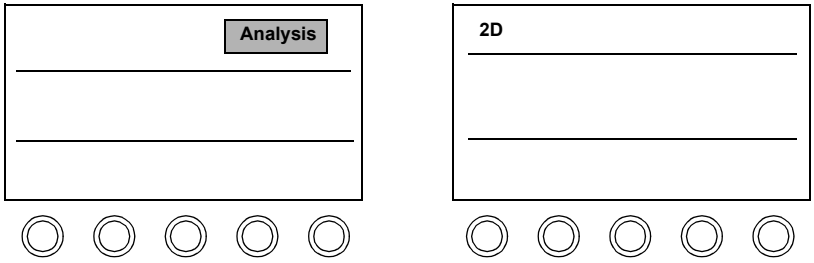
1. Touch **OB/GYN Exam**.
2. Touch the **OB** preset.
3. Touch **Analysis**.
4. Press Setup.
5. Use the trackball to select **Weight Percentiles** and press Enter. The **Weight Percentiles** window is displayed.



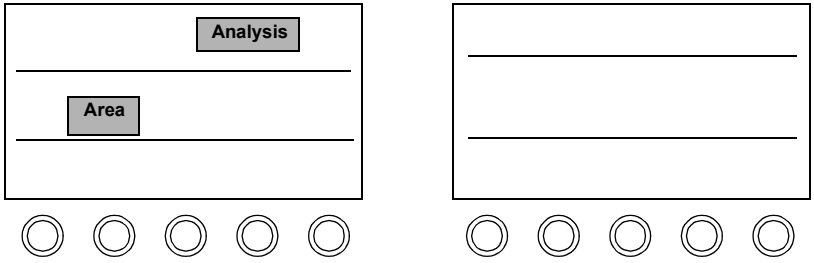
6. Use the trackball and press Enter to select the desired fetal weight percentile:
   - Use no fetal growth curves
   - Use Brenner's fetal growth curve
7. Press Setup to exit analysis setup. See the *Measurements and Calculations Reference* for fetal weight percentiles

Analysis Procedure

1. Touch **Analysis**. Be sure that the active mode and preset are appropriate for the measurement or calculation you want to perform.

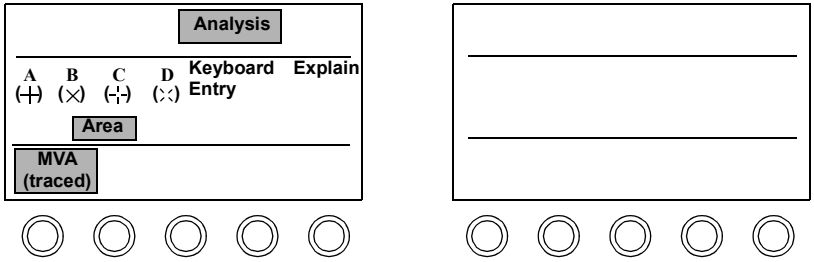


2. Touch the group containing the measurement or calculation you want to perform.

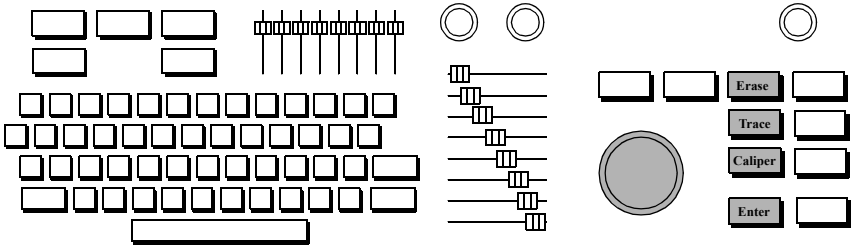


3. Touch the measurement or calculation you want to perform. To enter a measurement value, touch **Keyboard Entry** and type a value. To use a measurement value, touch the symbol corresponding to the value that you want.

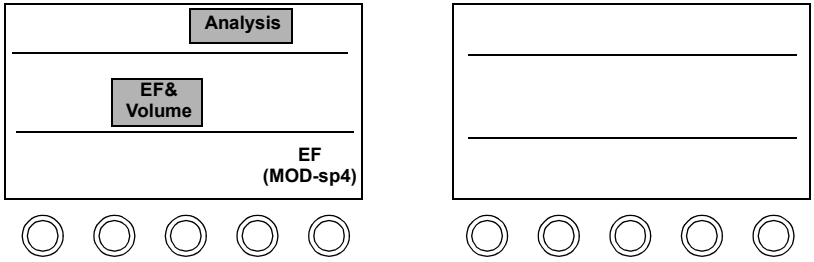
Tip: All needed measurements appear for a calculation.



4. Complete the measurement.

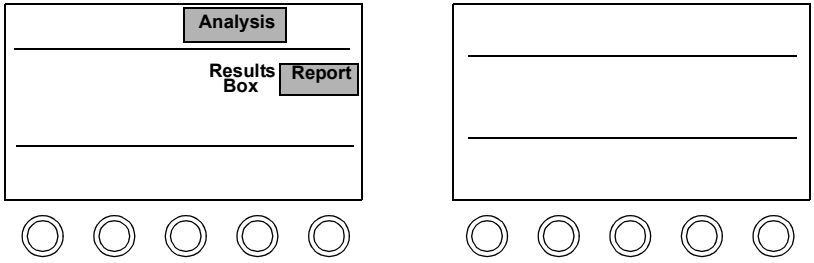


5. Touch the appropriate control to perform additional measurements and calculations. To perform the same measurement again, press **Trace** or **Caliper** to begin. You may have to touch another group to see the measurement or calculation you want.



6. To view the report for this patient, touch **Report**. Use **Report** controls to edit data, as necessary. Touching **Report** again removes the report from the screen.

   The results box shows the measurement or calculation just completed.



OB Growth Curves

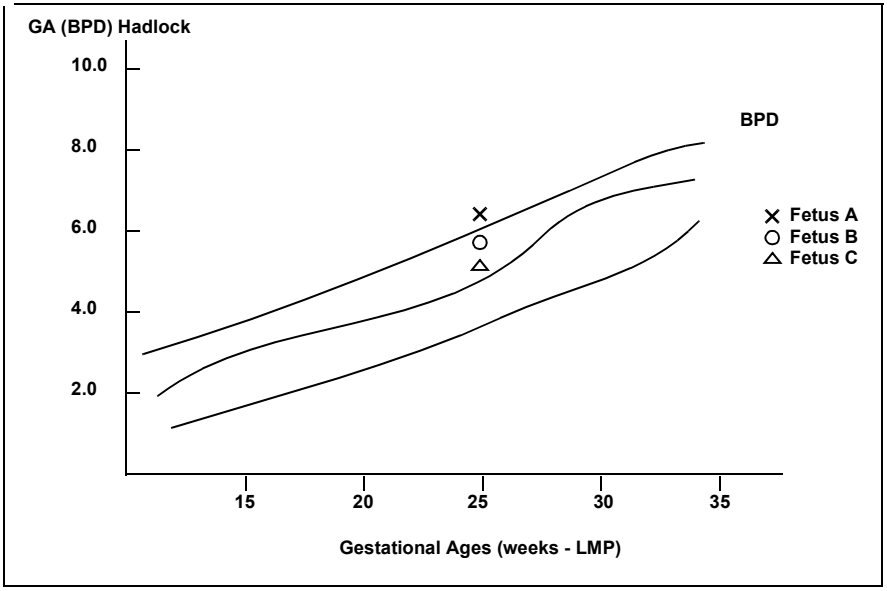
You can display growth graphs for obstetrical studies (obstetrical presets only). The resulting growth curves plot gestational age (GA) on the x-axis against the measurement upon which the derived age is based (for example, BPD) on the y-axis. X, O, or Δ is used when there are multiple fetuses:

- X = baby A
- O = baby B
- Δ = baby C

The fetuses are all part of the same study. The study is referred to by the patient ID, which should be the mother's name.

The fetus under study (X, O, or Δ) is plotted against the normative curves shown on the graphs. The type of calculation plotted depends on your Obstetrics Calculation setup and the measurements you make. You can display growth graphs for up to three fetuses.

The following illustration shows a sample gestational age graph. Each biometry has its own growth curve. The curves displayed represent the 50th percentile gestational ages from established studies. Depending upon the measurements in use, curves showing +/- standard deviation from the 50th percentile are also shown. The middle curve is the norm, and curves on each side represent the standard deviations.



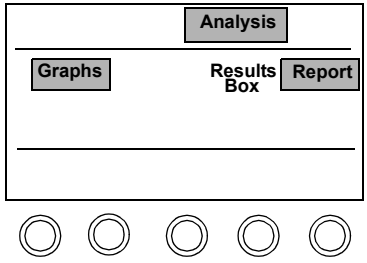
If an expected GA has been entered, then that value is used to determine the values shown on the x-axis. If no expected GA has been entered, but a Last Menstrual Period (LMP) has been entered, the x-axis uses the LMP value. For estimated fetal weight (EFW), you can choose to display EFW against age by LMP or against average ultrasound age (AUA) if both are available.

If you want to use the GA (LMP) parameter, an LMP value must be entered.

If more than one measurement is made for a biometry, the system plots the average value for that measurement.

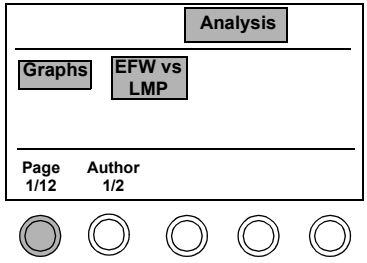
Displaying Obstetrical Growth Graphs

SONOS displays obstetrical growth graphs for configured gestational age calculations. When appropriate data is acquired, SONOS plots a fetus on the graph. If data has not been acquired to produce a graph, the system displays the normative curves with the text NO DATA at the top left of the graph.The following figure shows the obstetrical growth graph controls.



To display obstetrical growth graphs:

1. Touch **OB/GYN Exam** and then the **OB Early** or **OB** preset.
2. Touch **Analysis** and then **Report**.
3. Touch **Graphs**. The system displays the first in the series of available graphs.
4. Turn the **Page** rotary control, which now appears to select the desired graphs.

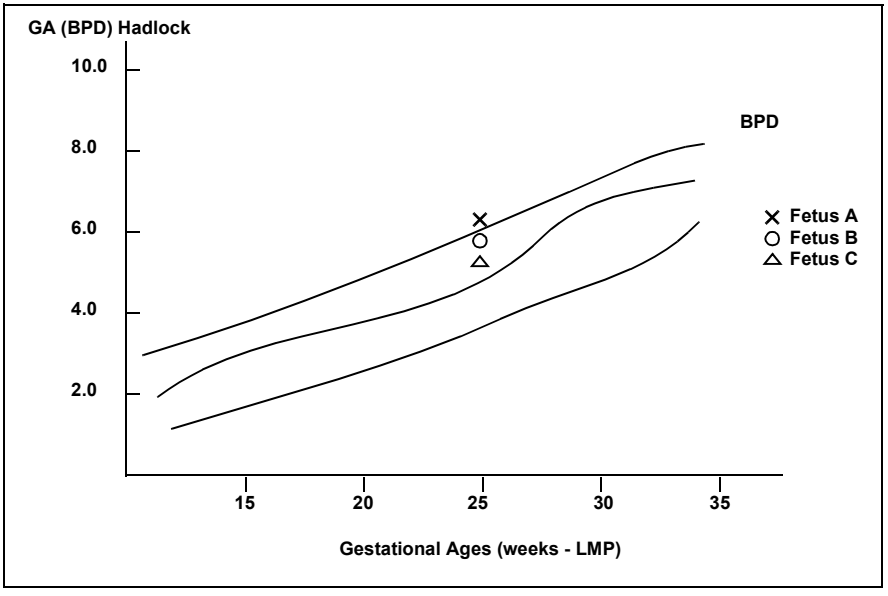


5. If this is an EFW, touch **EFW vs LMP** or **EFW vs AUA** to select whether you want the graph to plot the fetal weight against a GA (LMP) parameter or against the AUA.
6. Turn the **Author** rotary control to select among the authors you have configured for EFW calculations.

Displaying OB Graphs for Multiple Fetuses

You can graph up to three fetuses on one display. By observing the different markers for each fetus (X for Fetus A; O for Fetus B; Δ for Fetus C), you can compare the data among the fetuses as well as between each fetus and the established-norm curves. You must specify the number of fetuses in the patient ID to enter and display data for more than one fetus. Data from only one study can be represented on any one graph at a time. If there is more than one calculation for a biometry, only the calculation that contributes to the AUA is plotted. If you have used different calculations to contribute to the AUA for different fetuses, a window allows you select which calculation to use. For example, if fetus A uses GA(BPD) Hadlock and fetus B uses GA(BPD) Jeanty, a window appears offering a choice between the two.

The following illustration shows a sample gestational graph for triplets.



Analysis Troubleshooting

Symptoms	Suggestions
Completed calculation does not display.	Make sure you have completed all measurements displayed on the touch panel for this calculation.
Measurement or calculation is unavailable.	Touch the other groups displayed to see if the measurement or calculation you want is there. If not, press Setup, highlight **Edit** under **Meas/Calc**, and page through the choices until you find the one you want. Touch it to add it to the touch panel, under the currently active group.
Wrong report appears.	Touch the report label that matches the report you want to view.
Report control is not on the touch panel .	Either complete the active measurement, or turn it off by touching it.
Report pages are printed on the wrong printer.	Press Setup, touch **Print**, and adjust **Report [printer]** to display the printer to use for report pages.

CAUTION On some systems, characters may appear blurred, particularly in frozen or paused studies played back from a video recording.

To assure the best possible legibility, Philips recommends the following:

- When possible, review reports and measurements live, as they are produced. Make prints at that time for later review.
- When viewing videotaped studies that contain unclear characters on paused or frozen displays, unfreeze the tape and view the information in play mode.

For additional information, consult your Philips representative.

11 Loops

Introduction

SONOS loop controls allow you to acquire, store, retrieve, bookmark, and review looping sequences of images. This chapter provides information about

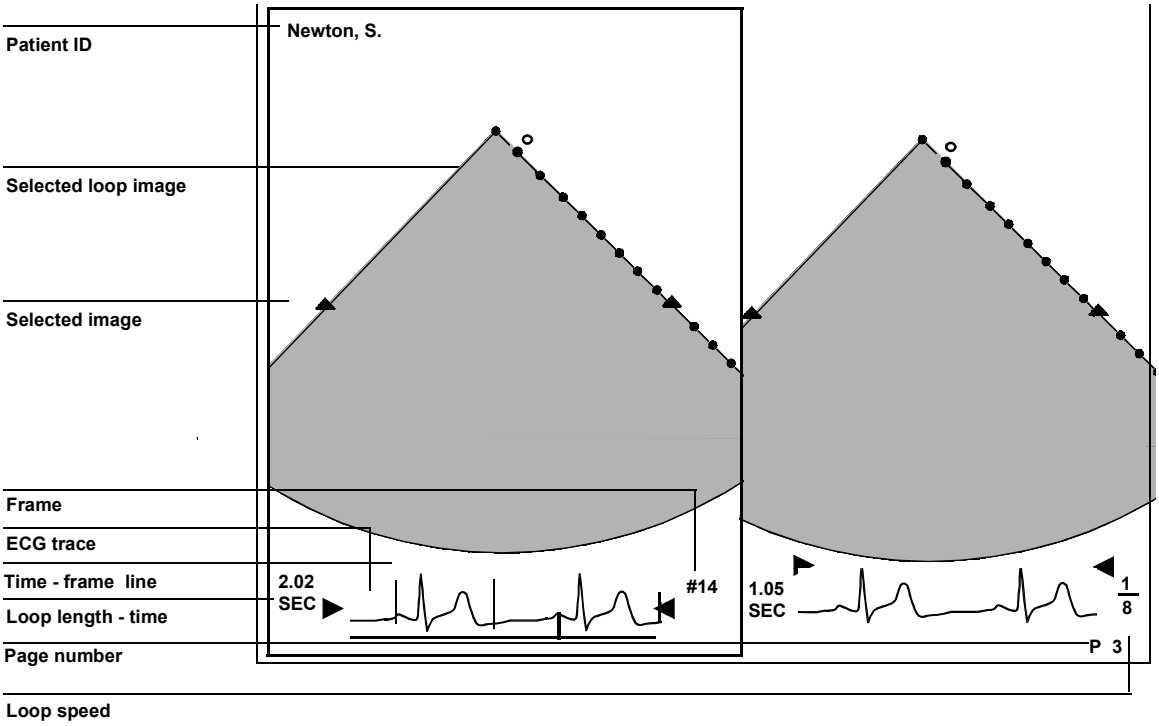
- Loop screen and touch panels (page 11-2)
- Controls (page 11-3)
- Setting up loop images (page 11-9)
- Acquiring loop images (page 11-11)
- Acquiring images in Compare Mode (page 11-16)
- Acquiring Quick Review images (page 11-18)
- Reviewing studies (page 11-21)
- Loop troubleshooting (page 11-31)

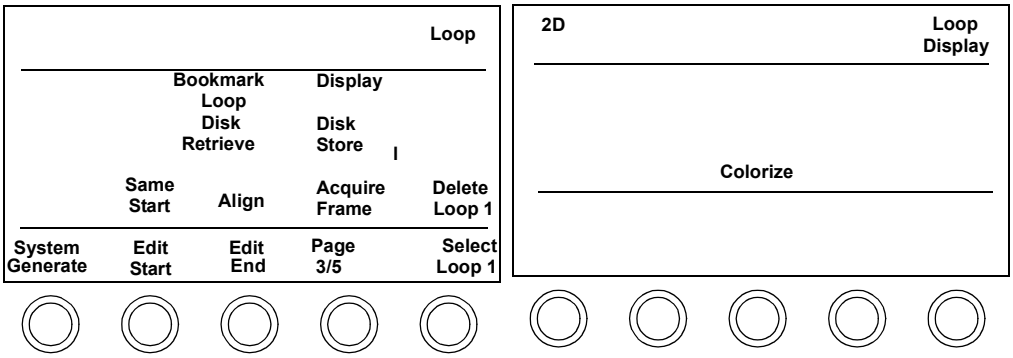
NOTE

See the *Using 3-Dimensional and BiPlane Imaging Guide* for details about loop controls for Live-3D imaging.

Screen and Touch Panels

This illustration shows frozen acquired images displayed in split format.





Controls

Primary

The number of frames acquired in a loop varies, depending on how the loop was acquired (that is, beats versus time), the frame rate of the system, and how much memory is in the system.

Acquire	Captures a frame or the next series of frames onto a page in loop memory. You can also use the **Acquire Loop** touch control. If **Auto Display** is on, press Acquire to delete the loop and press Acquire again to capture a new loop. Press Enter to accept the loop.
Acquire Loop	Captures the next series of frames onto a page in loop memory. You can also use the Acquire key.
Acquire Frame	Captures the next frame into loop memory. You can also use the Acquire key.
Align	Synchronizes the start and end time of two or more acquired loops.
Beats	Sets the number of heart beats acquired per loop. Is available only when **Loop Type** is set to **Beats**.
Bookmark Loop	Marks the selected loop for display when **Show Bookmarks** is touched. Touch **Bookmark Loop** again to remove bookmarking.
Bookmark Page	Marks the selected page for display when **Show Bookmark**s is touched. Touch **Bookmark Page** again to remove bookmarking.
Border	Suppresses AQ borders on looping AQ images.
Cancel	Cancels loop store or retrieve operations.

Color Suppress	Removes color from looping color images.
Colorize	Optimizes contrast resolution by activating the current colorization map and overlaying the grayscale image. To change the active map, turn the color rotary control just under the **Colorize** touch control.
Compare	Displays a real-time image beside one or more looping images. Available when **Vsplit**, **Cropped**, or **Reduced Formats** are active.
Delete All Pages	Deletes all pages in loop memory.
Delete Page	Marks a page for deletion while in Display mode. Once you touch **Delete Page**, the control changes to **Undelete Page**. If you change your mind, touch **Undelete Page**. Touching **Display** or **Loop Display** after touching **Delete Page** deletes a loop from loop memory.
Disk Autostore	Automatically stores a loop or frame to the hard or optical disk after you acquire and accept it. Images are stored under the current patient ID.
Disk Retrieve	Retrieves the selected study from the disk and displays it. If you want to display only selected images from a study, highlight **List Contents** and select the images you want to retrieve.
Disk Store	Stores the currently selected loop, frame, or analysis report to disk and keeps the current patient ID information.
Display	Shows acquired loops and frames. Touch **Display** again to exit Display mode.
Edit End	Changes the end point of a selected loop.
Edit Start	Changes the beginning point of a selected loop.

Format

Lets you select the format for acquiring and displaying loops. The formats are

- **Full**—Acquires in full screen format.
- **Cropped**—Acquires within a region of interest, the highest quad format resolution.
- **Reduced**—Acquires a quad format that lets you display the entire imaging sector.
- **Vsplit**—Acquires within a region of interest a side-by-side format. Can be used to compare two images side-by-side.

Note: If you turn the **Format** rotary control to **Full** before you retrieve a study, the study is displayed in the previously stored format

Freeze

While in live imaging:

- Press Freeze to enter Quick Review. Use the trackball for frame review.

To display frames in a looping format:

- Touch **Replay**. Press Freeze and touch **Acquire Frame** to acquire a frame. Press Acquire or touch **Acquire Loop** to acquire a loop.

Loop Display

Indicates that an acquired loop is on the screen. Touch **Loop Display** to return to live imaging. Appears on the right primary touch panel.

Loop Type

Lets you determine the length of an acquired loop. Choices are

- **Beats**—By number of heart beats
- **Time**—By seconds

Manual Entry	One of the selections available when you turn the **Comment** rotary control. Lets you type or change the disk storage comment. In Disk Setup the comment can be set to **System Generate**, **Manual Entry**, or an exam type. See "Setup" on page 12-6 for more information on Comment Options.
Map	Changes the color flow map used for selected color loops. Maps represent conventions and flow characteristics assigned to the active BART (Blue Away, Red Toward) or RABT (Red Away, Blue Toward) map. (Appears on the primary right touch panel when a color image is displayed.)
Map Invert	Switches between the BART (Blue Away, Red Toward) and RABT (Red Away, Blue Toward) color map conventions for selected color loops. (Appears on the primary right touch panel when a color image is displayed.)
Memory Gauge	Turns the display of the memory gauge on and off. The memory gauge shows you how much loop memory has been used and how much is available.
Replay	Shows captured frames in a loop. Available after you press **Freeze** during live imaging.
Same Start	Makes two or more stored loops begin at the same time. Available under the **Loop Display** controls.
Select Loop	Outlines the selected loop on the screen, if there is more than one loop on the page. Enables bookmarking, editing, and storing of the selected loop.
Select Off	Removes the outlines from the displayed loops.
Select Page	Outlines one page of loops on the screen. Enables bookmarking, editing, and storing of the selected page.
Select Region	Displays the markers that outline the area of the screen to be acquired as a loop. Available only when **Vsplit** and **Cropped** formats are active. Touch **Select Region** again to remove the markers.

Show Bookmarks	Displays only the bookmarked loops and frames. Touch **Show Bookmarks** again to see all of the acquired images.
Time	Sets the loop length in seconds. Available only when **Loop Type** is set to **Time**.
T-Set	A T-Set is a multiple frame triggered set of frames. The **T-Set** control adjusts the number of T-Sets. The **T-Set** control is located in the **Loop** touch panel.
Zoom	Expands or contracts a frozen image during Loop Replay.

Setup

Display Options — Sets the loop display options to **Manual Display** or **Auto Display**.

Manual display—Does not display a loop after it has been acquired. You must manually enter Display mode by touching the **Display** control.

Auto display after each acquire—Automatically enters Display mode after a loop has been acquired, showing the acquired loop.

Frame Lock — Prevents video frames from being generated with different acoustic data on the even and odd fields. This touch control is active in CLR or Stress paused mode.

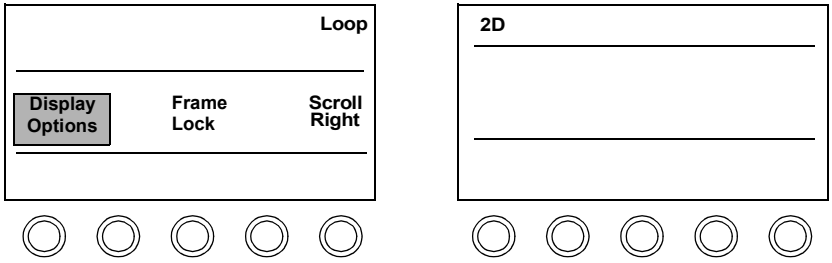
When active, loops are acquired at or below the video rate (30 Hz in the U.S.A., 25 Hz elsewhere), regardless of the acoustic frame rate. Eliminates jitter during slow motion playback. This control has no effect on acoustic cine acquisitions, which capture loops at the acoustic rate with no jitters.

Scroll Right — When **Scroll Right** is active, roll the trackball to the right to see Doppler and MMode data from the period before the image was frozen. When **Scroll Right** is inactive, roll the trackball to the left to see this data.

Setting Up Loop Images

Tip: Many loop and disk settings can be preset. You can choose many combinations to best meet your needs and store them to your own preset.

1. Press Setup, touch **Loop**, and touch **Display Options** to choose the display options.

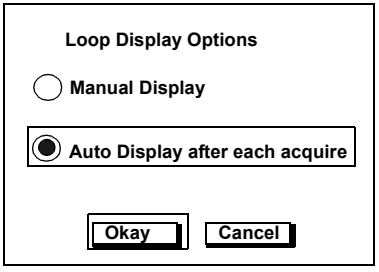


2. Using the trackball, highlight the display option you want and press Enter. (**Auto Display** is the suggested setting for cardiac presets.)

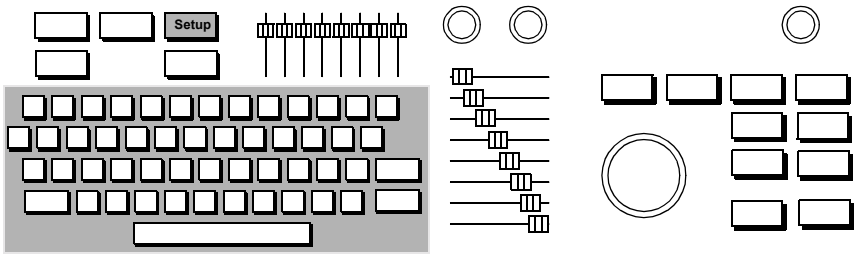
a Choose **Manual Display** if you do **not** want the acquired loop to display after each acquisition.

b Choose **Auto display after each acquire** if you want the acquired loop to automatically display after each acquisition.

c Highlight **Okay** and press Enter.



3. Press **Setup** again to leave Setup mode.



Acquiring Loop Images

You can acquire images onto multiple pages of loop memory and review them after each acquisition or review them at the end of all of the acquisitions. If your system has the digital storage and retrieval option, you can automatically store all images to disk, store the currently selected image, or bookmark certain images and store only the bookmarked images to disk.

This section discusses how to acquire loops, and the next section tells you how to acquire high-frame-rate images. Chapter 12 discusses how to store images to the optical disk. If your system has the Integrated Digital Interface option, see the *Using Integrated Digital Interface (IDI) User's Guide* for setup and storage information.

Auto Display

If **Auto display after each acquire** is enabled, the acquired loop automatically is displayed after the acquisition.

Manual Display

If **Manual Display** is enabled, a white box appears in the screen's lower right corner. The appearance of the box indicates the loop format, as follows:

Full

Vsplit

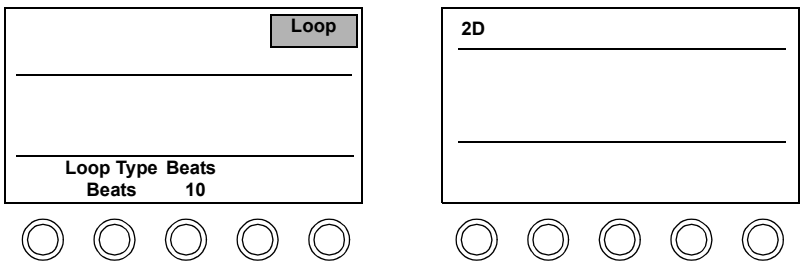
Reduced Cropped

During acquisition, the box disappears, indicating that acquisition is in progress. When the box reappears, the acquisition is complete. You can continue acquiring or touch **Display** to review all acquired loops using the **Page** rotary control.

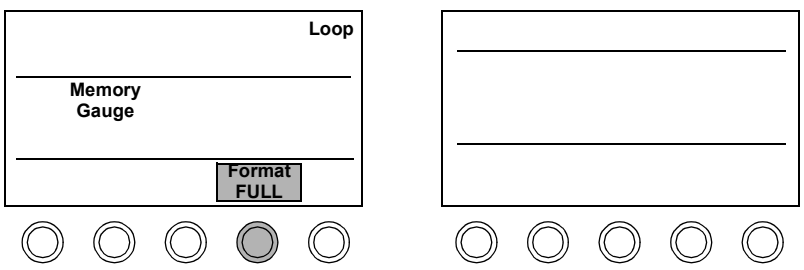
1. With **2D, BMode, Color**, **Angio**, or **AQ** active, touch **Loop**. Select the desired loop length, using the **Loop Type** rotary control.

   You can determine the length of the loop display in seconds or by number of heart beats.

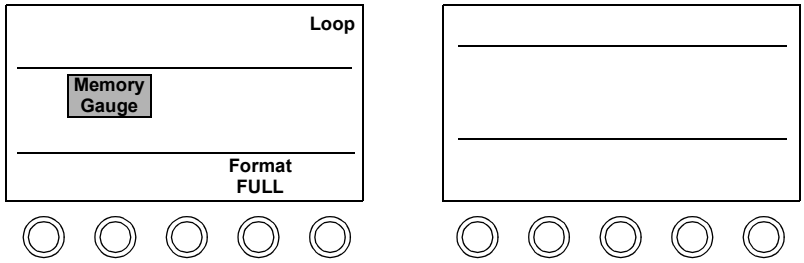
Tip: If you want to capture a longer sweep, set the **Loop Type/Beats** rotary controls to a higher number, such as 10 beats.



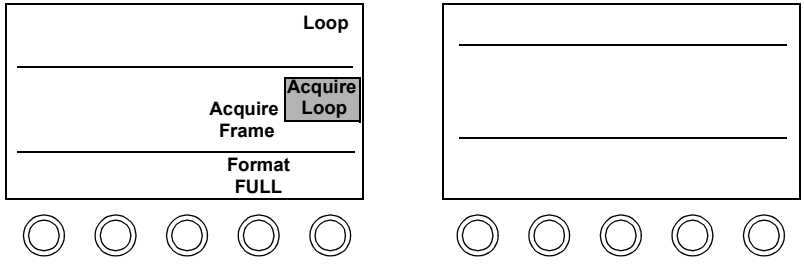
2. Select the desired loop format. If you acquire the loop in a smaller format (**Quad**, **Cropped**, or **Vsplit**), you cannot view it in **Full** format.



3. To see how much memory the acquired loops have used, touch **Memory Gauge**.

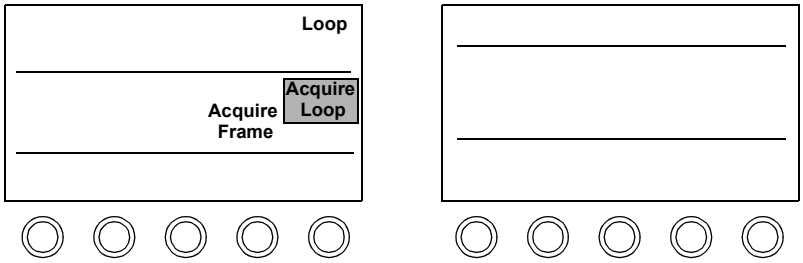


4. Touch **Acquire Loop** or press Acquire to capture the upcoming series of frames into loop memory. Note that the light on the Acquire key turns on during the acquisition and turns off when the acquisition is complete.



5. If you are using the touch controls or if **Manual Display** is enabled and you want to reacquire the loop, touch **Display**, **Delete Page**, **Display**, and then touch **Acquire Loop.**

   If you are using the Acquire key and **Auto Display** is enabled, see the next section for information on how to reacquire a loop.



NOTE You cannot use the Acquire key to reacquire a loop if you manually enter Display mode by touching **Display**.

Using the Acquire and Enter Keys in Auto Display Mode

When **Auto Display** is enabled, you can use the Acquire and Enter keys to easily acquire, delete, accept, and reacquire loops.

1 Press Acquire to capture the upcoming series of frames into loop memory, which are displayed automatically.

2 If you are satisfied with the loop, press Enter to accept it.

3 Or, if you want to reacquire the loop:

   a Press Acquire to delete the loop.

   b Press Acquire again to capture the upcoming series of frames into loop memory.

      The light on the Acquire key turns on during the acquisition and turns off when the acquisition is complete.

   c If you are satisfied with the loop, press Enter to accept it.

When **Auto Display** and **Disk Autostore** are enabled, the loop is not automatically stored to disk until you take one of the following actions:

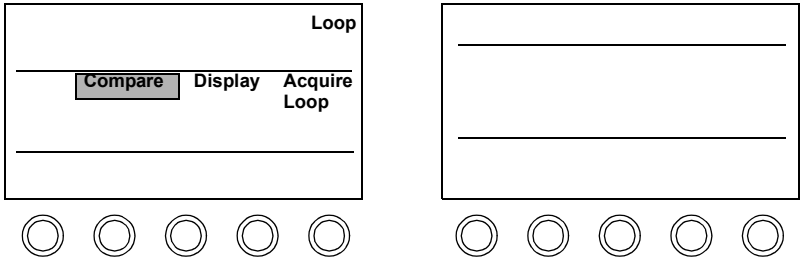
- Touch **2D**.
- Press Enter.
- Turn the **Page** rotary control.
- Select another loop on a page.
- Exit Display mode.

Acquiring Images in Compare Mode

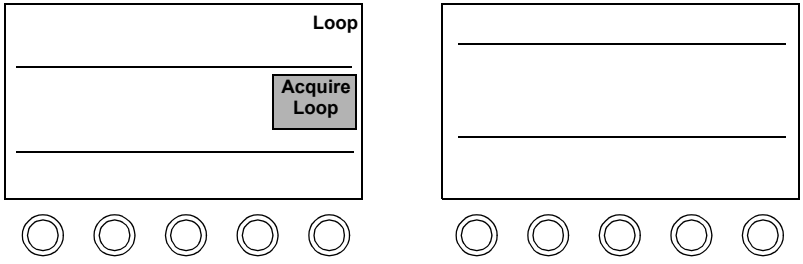
Use the **Compare** control to display a live image next to an acquired image. This can be helpful in the operating room when you want to compare a prebypass image with a postbypass image. Compare is only available when **Vsplit**, **Cropped**, or **Reduced** formats are selected.

The acquired loop in memory is displayed on the screen's left side when the **Vsplit** format is selected and a live image is displayed on the screen's right side.

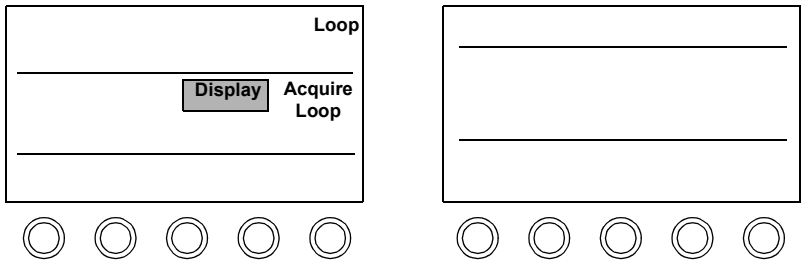
1. After acquiring one or more looping images, touch **Compare**. If you are in Display mode, touch **Display** to leave Display mode.



2. To acquire a live image into loop memory, touch **Acquire Loop** or press **Acquire** .



3. The newly acquired image is automatically displayed, even if your display option is set to **Manual Display**. Touch **Display** to leave Compare mode.



NOTE

If you do not want the newly acquired image added to loop memory, touch **Delete Loop** or **Delete Page** to mark it for deletion. The loop is deleted when you leave Display mode.

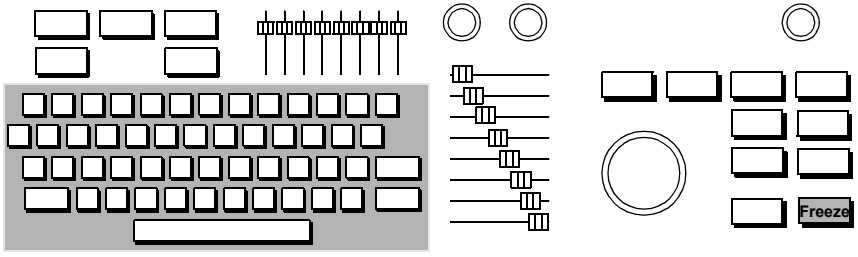
Acquiring Quick Review Images

Quick Review allows you to capture and display images at higher frame rates, up to 300 Hz. You can use Quick Review to view an image frame by frame by scrolling with the trackball. Quick Review is always available regardless of loop format or loop memory.

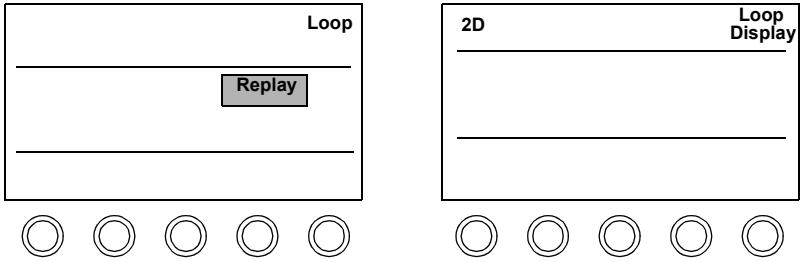
When you capture an image in Quick Review by pressing **Freeze**, it is not stored in loop memory but is stored in a separate memory location. To store an image to disk, you must first transfer it to loop memory by acquiring the loop when in Replay mode.

1. With 2D or Color mode active, press **Freeze** to enter Quick Review.

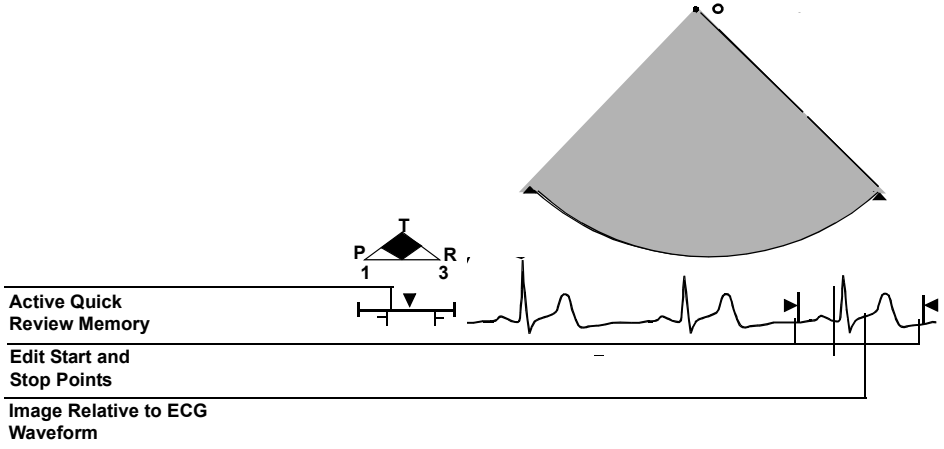
   The frames that are displayed before you pressed **Freeze** are captured.



2. Use the trackball to scroll through the frames. If you want to see the loop in real time, touch **Replay**. The end points of the loop automatically cycle on the last R-to-R interval that occurred before you pressed Freeze.

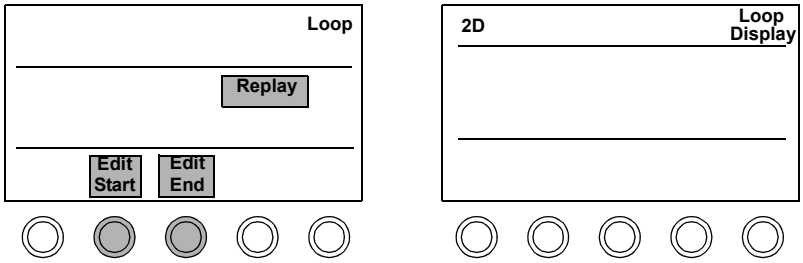


3. Use the trackball to control the speed of the loop. Press Freeze and use the trackball to scroll through the image frame by frame.

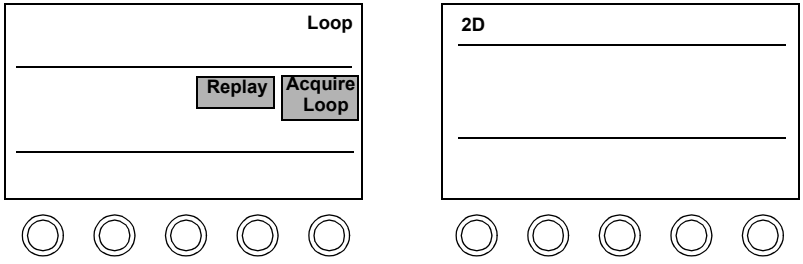


Tip: Edit the loop before you acquire it to use less memory.

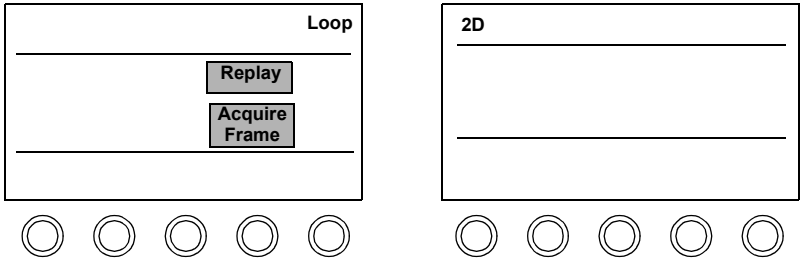
4. Use **Edit Start** and **Edit End** to adjust the start and end points of the loop.



5. Select the desired loop Format (**Full**, **Vsplit**, **Reduced**, or **Cropped**). Touch **Acquire Loop** or press Acquire to transfer the loop onto a page in loop memory. The system automatically returns to live imaging.



6. To acquire a frame, press Freeze and touch **Acquire Frame** or press Acquire to transfer the frame onto a page in loop memory.



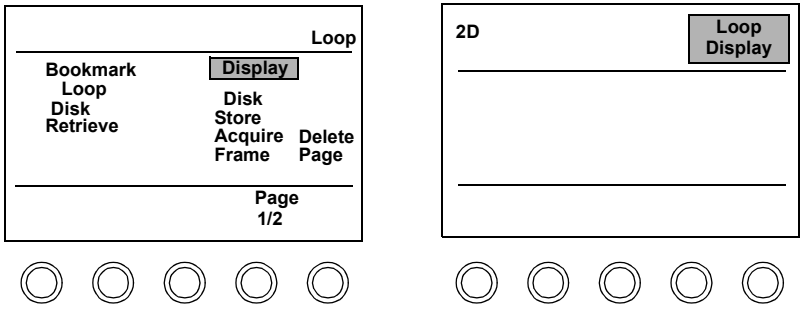
Reviewing Studies

Once you have acquired all of the loops and frames for your study, you can display them and review the entire study. When you review the study, you can

- Edit the loops by changing the start and end points or synchronizing the start and end times
- Bookmark individual loops or pages so that only the bookmarked loops or pages display
- Delete individual loops or pages from loop memory
- Store individual loops or pages to disk. You also have the option of storing bookmarked loops to the current study or to a new study for the current patient.

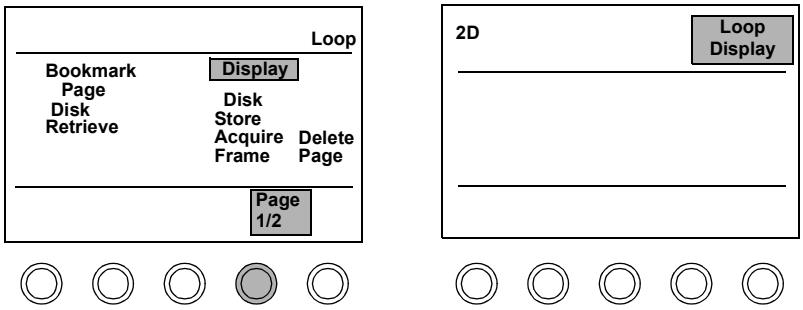
Displaying Loops

1. If **Auto Display** is enabled, loops automatically are displayed after acquisition. If **Manual Display** is enabled, touch **Display** to review the loop.



2. If you acquired more than one loop, the **Page** rotary control appears on the left touch panel. Turn **Page** to view all of the pages in the study.

   The number of loops on a page varies, depending on the loop format.



3. Use the trackball to change a loop's play back speed.

4. Press Freeze and use the trackball to view individual frames of a loop.

Editing Loops

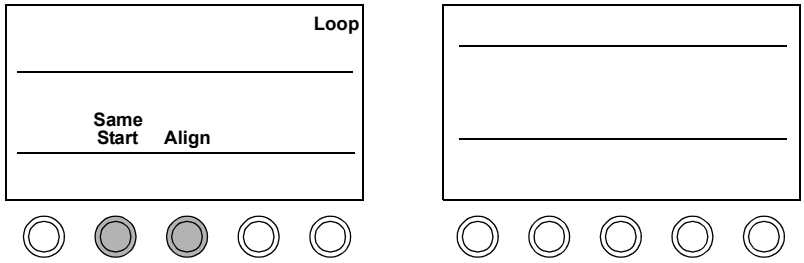
NOTE

Depending on how your storage options are set up, loops may or may not be automatically stored to disk. If loops are stored to disk, the frames between the start and end points are the portion of the loop that is stored to disk. See Chapter 12 for more information on storing images.

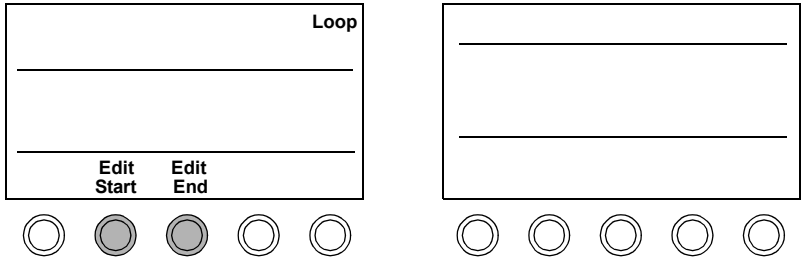
1. To synchronize loops, touch **Same Start** or **Align**. (You must display more than one loop on a page to see the Same Start and Align controls.)

   •**Same Start** causes loops to begin at the same time.

   •**Align** causes loops to begin and end at the same time.



2. Adjust **Edit Start** or **Edit End** to change the beginning or end point of the selected loop.



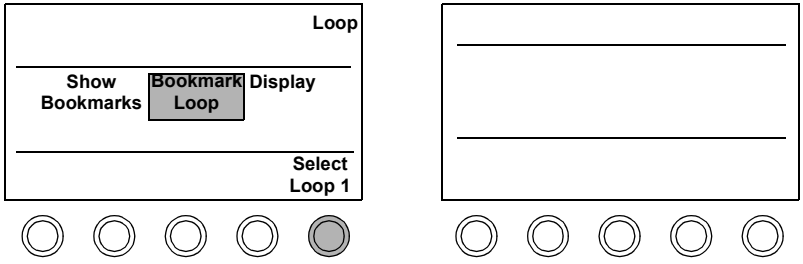
Bookmarking Loops

You can bookmark individual loops or pages so that only those loops or pages are displayed on the screen. For example, you might want to bookmark the loops that you want a physician to review.

1. Turn the **Page** rotary control to find the loop or page that you want to bookmark.
2. If there is more than one loop on a page, turn the **Select** rotary control to the loop that you want to bookmark. Touch **Bookmark Loop**.

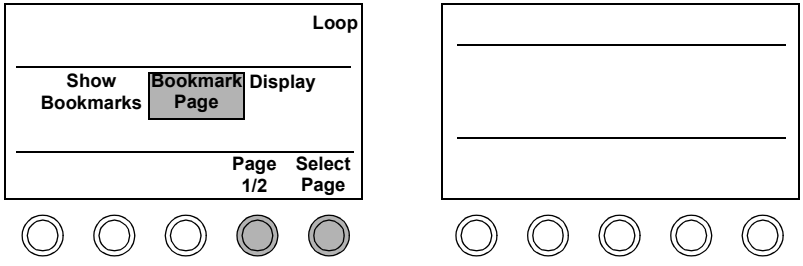
   The bookmark icon (a small rectangle), located in the loop's lower left corner, appears.

Tip: To remove a bookmark from a loop or page, select the loop or page and touch **Bookmark Loop** or **Bookmark Page** again.



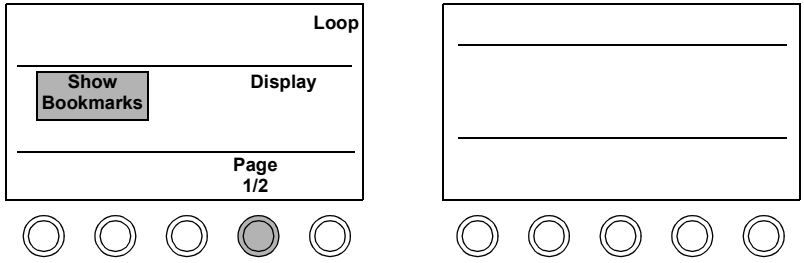
3. If you want to bookmark the entire page, turn the **Select** rotary control to **Select Page**, to select all of the loops on the page. Touch **Bookmark Page**.

   The bookmark icon appears.



4. Touch **Show Bookmarks**.

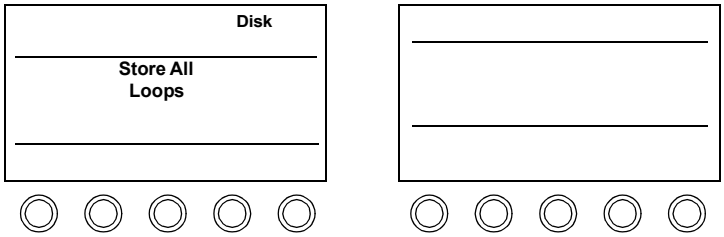
The loops or pages you bookmarked are displayed. Touch **Show Bookmarks** again if you want to see all of the acquired loops and pages.



Storing Bookmarked Loops to a New Study

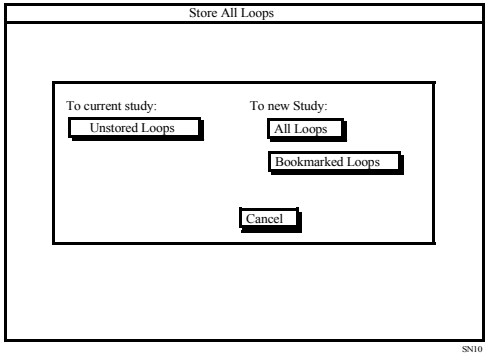
You can create a subset of your study by storing only the bookmarked loops to a new study.

1. Touch **Disk**.



2. Touch **Store All Loops**.

   The following window appears.



3. Highlight **Bookmarked Loops** and press **Enter**.

   A new study is created for the current patient that only contains the bookmarked loops. Patient ID information is cleared after being stored with current patient information.

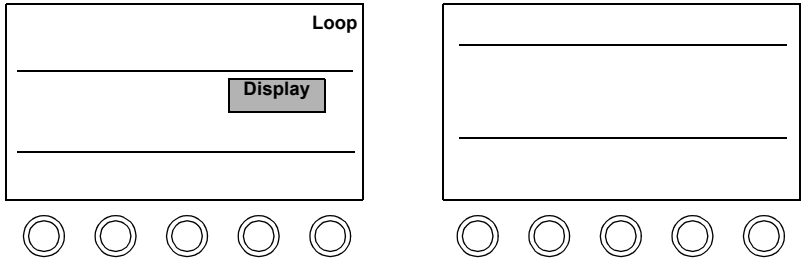
Deleting Loops from Loop Memory

You can mark loops and pages for deletion by using the **Delete Loop** and **Delete Page** controls. The loops are not deleted from loop memory until you exit Display mode and return to live imaging. To set up delete options, see "Setting Up Loop Images" on page 11-9.

NOTE

By default, **Delete Loop** and **Delete Page** only delete images from loop memory. Images stored on disk are not affected *unless* the user has selected **Delete loop from disk when manually deleted from loop memory?** under the **Delete Options**.

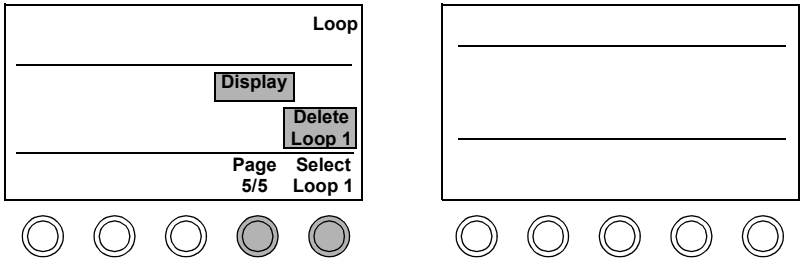
1. Touch the **Display** control to show the loops in the study.



2. Turn the **Page** rotary control to find the loop or page that you want to delete.

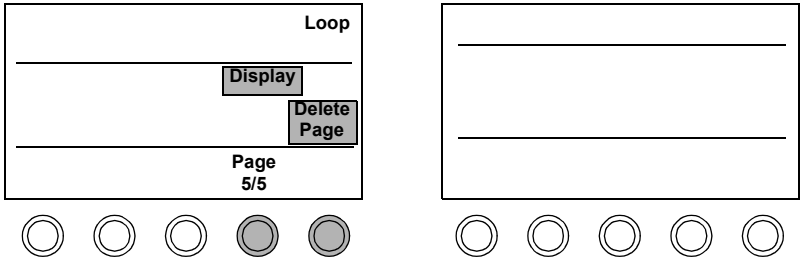
3. If there is more than one loop on a page, turn the **Select** rotary control to highlight the loop that you want to delete and touch **Delete Loop**.

   The message "Marked for Deletion" appears on the loop and the **Delete Loop** control changes to **Undelete Loop**. If you change your mind, touch **Undelete Loop**.

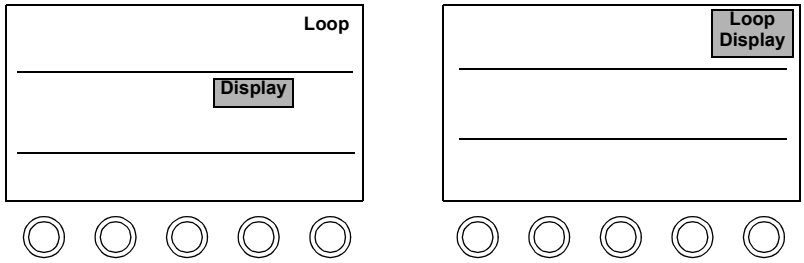


4. If you want to delete the entire page, touch **Delete Page.**

   The message "Marked for Deletion" appears on the page and the **Delete Page** control changes to **Undelete Page**. If you change your mind, touch **Undelete Page**.



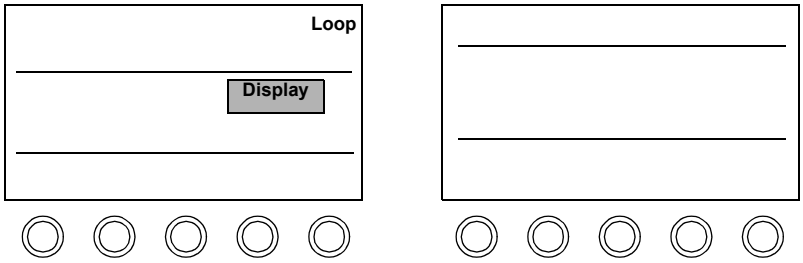
5. To delete the marked loops and pages from loop memory, return to live imaging by touching **Display** or **Loop Display**.



Deleting All Pages

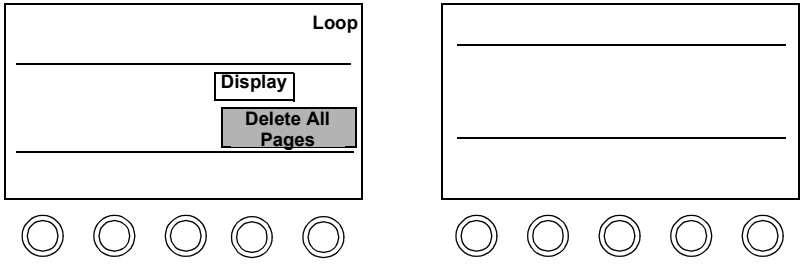
You can delete all loops and pages from loop memory by using the **Delete All Pages** control.

1. Touch **Display** to show the loops in the study.



2. Touch **Display** again to unhighlight it.

3 Touch **Delete All Pages**. You must be in a live imaging mode to see this function.



Note: Delete All Pages only deletes from loop memory, not from the disk.

Loop Troubleshooting

Symptoms	Suggestions
Cannot see frames removed from a loop.	Move the start and end points of the loop to their original locations with **Edit Start** or **Edit End**.
Looping image or text flickers, or looks blocky.	The loop was acquired when the system's frame rate exceeded the monitor's maximum frame rate (that is 25 Hz for European screens and 30 Hz for U.S.A. screens). If possible, reacquire the loop with a lower frame rate. Use Quick Review to acquire loops at the displayed frame rate. Or touch the **Frame Lock** control in **Loop Setup**.
Image or text on a frozen loop looks blocky.	If the frame rate is 40 Hz or less, scroll forward or backward one frame. Touch the **Frame Lock** control in **Loop Setup**. Use Quick Review to acquire loops at the displayed frame rate.

12 Disk

Introduction

The standard SONOS system configuration includes an

- Internal hard disk—For temporary storage of exam images
- Optical disk drive—For permanent offline storage of exam images
- Floppy disk drive—For saving and loading system presets, upgrading software, installing software options, and servicing the system

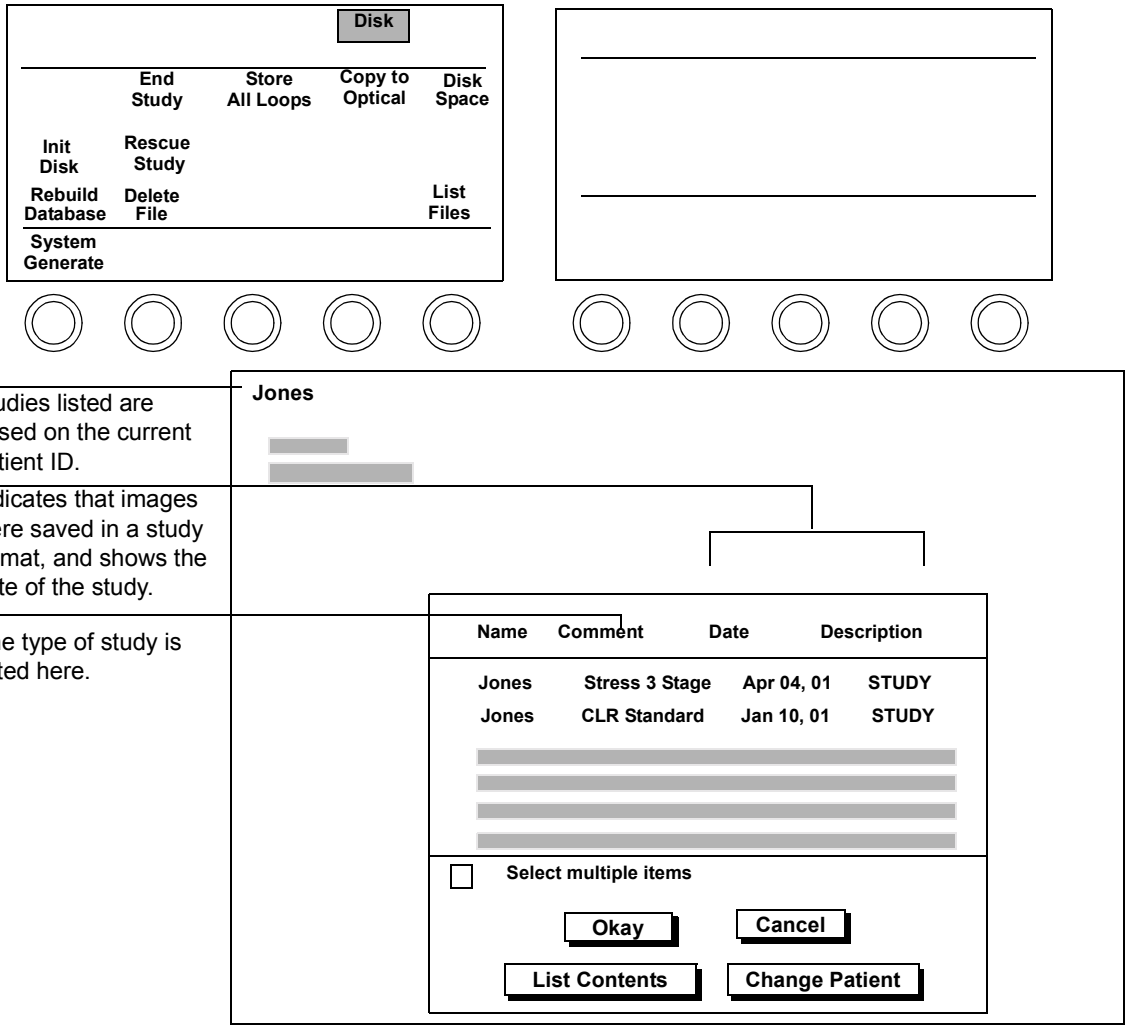
This chapter provides information about

- Disk screen and touch panels (page 12-2)
- Controls (page 12-3)
- Formatting a disk (page 12-11)
- Initializing a disk (page 12-13)
- Configuring disk storage (page 12-14)
- Storing images to disk (page 12-21)
- Retrieving loops from disk (page 12-29)
- Deleting disk files (page 12-32)
- Optical disk troubleshooting (page 12-34)

NOTE For more information about the system floppy disk drive, see Chapter 4 .

NOTE For information about storing and retrieving Live 3D images, see the *Using 3-Dimensional and BiPlane Imaging Guide*. (BiPlane images are stored using the system's normal 2D loop disk controls.)

Screen and Touch Panels



NOTE You must be in Loop mode and touch **Disk Retrieve** to see the above window.

Controls

NOTE

The Optical Disk feature may not be available on your system. If your system has the Integrated Digital Interface, see the *Using Integrated Digital Interface (IDI) User's Guide*.

Primary

Copy to Optical — Copies disk storage and retrieval (DSR) files from the IDI hard disk to the optical disk. You can select one or more studies or files to copy.

Delete File — Lets you select and delete files or studies from the optical or hard disk.

Disk Space — Shows the amount of remaining space on one side of the optical or hard disk, in kilobytes (kB) and the approximate number of loops available.

End Study — Closes the current study and stores all loops, frames, and analysis data to disk. Patient ID information is cleared. All loops are deleted and analysis data is erased. If the system has the IDI option, all files from the ended study are sent to the network. Also is displayed as part of the **Stress** controls.

Init Disk	Prepares one side of a preformatted optical disk for storage and retrieval. You must initialize each side of an optical disk before using it for the first time. When you initialize or format a disk, you are always prompted with a window to select the target device, regardless of whether **Enable Optical** is on. **CAUTION:** The SONOS system hard disk is initialized before shipment. Do **not** initialize the SONOS hard disk unless a Philips Service Representative asks you to do so. Initializing the SONOS hard disk erases **all** information on the disk.
List Files	Shows the names of files and studies stored on the current side of the inserted optical disk or the IDI hard disk.
Loop Display	When the **Loop** control is on, an image from the optical or hard disk is displayed on the screen. Touch **Loop Display** or **2D** to return to live imaging.
Manual Entry/ System Generate	Lets you select the disk storage comment. In Disk Setup under **Comment Options**, the comment can be set to **System Generate**, **Manual Entry**, or an exam type.
Rebuild Database	Allows you to choose whether to reconcile or rebuild the database on the hard disk or optical drive. The **Reconcile** option scans the database for the studies that are supposed to exist on the disk. If a study no longer exists on the disk, the study is removed from the database. The **Reconcile** option is quick, since the entire disk does not need to be scanned. The **Rebuild** option scans the entire disk looking for studies and images, and creates a new database with references to each study and image found on the disk. The Rebuild option can be time consuming, since the entire disk must be scanned.

Rescue Study	Sends untransferred studies that are on the hard disk to the network storage server.
Store All Loops	Displays the **Store All Loops** window, which gives you the option of storing all unstored loops to the current study, storing all loops to a new study, or storing all bookmarked loops to a new study for the current patient. **Note:** If **Store All Loops** or **Bookmarked Loops** is selected, the patient ID information is cleared after being stored with the current patient information. If **Unstored Loops** is selected, the patient ID information remains.

NOTE

To avoid possible file corruption, it is recommended that you write protect the optical disk medium prior to installing or retrieving files on a Philips SONOS or EnConcert System when using a third party program.

Setup

Press Setup and touch **Disk** to adjust these controls. Press Setup again to exit from Setup mode.

Comment Options	Lets you choose either **Exam-Type**, **System Generate**, or **Manual Entry** comments. Also allows you to choose **Automatic Commenting** on or off and **Comment Auto-Advance** on or off. These comments are displayed when you store a file. See "Commenting Options" on page 12-9 for an explanation of the different options.
Format Disk	If you need to format an optical disk, you must power cycle the ultrasound system after the operation is complete. This is necessary before any further digital storage and retrieval operations can be attempted. If you do not power cycle the ultrasound system, the following message appears: "A Format Disk has been done. The system must be powered off and powered back on before using Disk operations." This error message occurs even if the format operation fails. For example, the error message will appear if you attempt to format a write-protected optical disk. **CAUTION:** The SONOS system hard disk is formatted before shipment. Do **not** format the SONOS hard disk unless a Philips Service Representative asks you to do so. Formatting the SONOS hard disk erases **all** information on the disk.

Tip: For details on how to use **Enable Optical** with the IDI hard disk, see the *Using Integrated Digital Interface (IDI) User's Guide*.

Note: Before viewing files on the optical disk, Philips recommends that you write-protect the optical disk on both the A and B sides before inserting it into a viewing station such as a Windows NT computer

Enable Optical

Lets you select the optical disk as the target device when both a hard disk and an optical disk are installed. When **Enable Optical** is on, all system data is stored to the optical disk. When **Enable Optical** is off, all system data is stored to the hard disk.

This control is off by default. It is a system-wide control that, when set, remains set until you change it. The **Enable Optical** window appears before every disk retrieval or utility operation, and also before the first disk storage operation in a study.

When **Study Mode** is off and **Enable Optical** is on, every disk storage operation goes to the optical disk without the window prompt. However, retrieval and utility operations still require the window prompt. If **Enable Optical** is off, all disk operations go to the hard disk.

Network Autosend

Available under the **Disk** controls when you press Setup. Sending a complete study to a network can take some time. When you enable **Network Autosend**, as soon as an image is stored to the local disk, IDI begins sending the image to the network server. When **Network Autosend** is not enabled, the IDI system does not start sending the study to the network server until you touch **End Study**.

Delete Options

Lets you choose whether or not to automatically delete an acquired loop from loop memory after it is stored to disk. Also lets you choose whether to automatically delete files from the disk when they are manually deleted from loop memory.

Maximize Transfer/Frames

Works in conjunction with the **Acquire 120Hz/300Hz** control in 2D imaging **Setup**. **Maximize Frames** acquires images up to 300 Hz. **Maximize Transfer** acquires images up to 120 Hz.

Tip: To facilitate file management, **Study Mode** is on by default.

Study Mode

Selects a subdirectory storage format (study format) for saving images to disk. Storing and retrieving images with **Study Mode** on facilitates study management. **Study Mode** *must be on* to transfer studies to the network storage server. This control is "on" (highlighted) by default. **Study Mode** is a control that is stored as a preset.

Commenting Options

Comment Option	Description and Usage
E**xam-Type List** Tip: The comment list can be customized and saved to a preset.	Selects a comment from a customizable comment list. Can be used in conjunction with **Comment Auto-Advance**. Highlight **View Exam Contents** to view and edit the comment list.
System Generate	Generates a comment automatically for the acquisition. Comments are unique and include references to exam type, preset, system mode, and a unique counter (for example, **Vas Carotid PW01**). Each system-generated comment includes a mnemonic symbol to identify the imaging mode that produced the image, such as **PW** in the above example. The mnemonic symbols are **2d**—2D/Bmode, PW (spectral off), or CW (spectral off) **3D**—Live 3D **3DZ**—3D Zoom **4FV**—3D Full Volume **Ang**—Angio in 2D/BMode, PW (spectral off), or CW (spectral off) **AQ**—Acoustic Quantification **BP**—BiPlane **Col**—Color in 2D/BMode, PW (spectral off), or CW (spectral off) **CW**—CW (spectral on) **CWA**—CW Angio (spectral on) **CWC**—CW Color (spectral on) **IBS**—IBS **M**—MMode **MC**—MMode Color **PW**—PW (spectral on) **PWA**—PW Angio (spectral on) **PWC**—PW Color (spectral on)

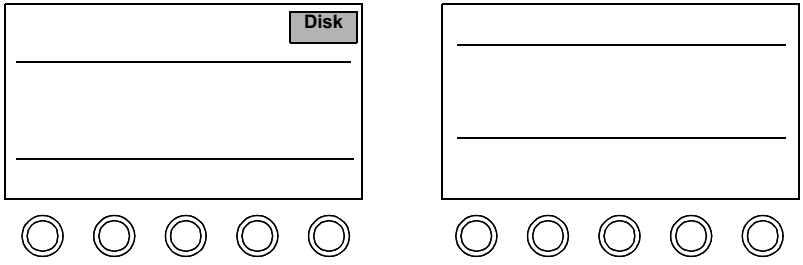
Comment Option	Description and Usage
Manual Entry	Allows you to enter a comment for each acquisition file, if **Automatic Commenting** is off.
Automatic Commenting on	Disables the DSR comment box. The image is stored with the current comment automatically applied to the file. Select the comment using the **Comment** rotary control before storing the loop.
Automatic Commenting off	Enables the DSR comment box, which appears on the imaging screen when storing a loop. The DSR comment box displays the comment that will be saved when the image is stored to disk. You can edit the comment before the file is stored.
Comment Auto-Advance on	Used only in conjunction with exam-type commenting. On each subsequent loop store, the comment is advanced to the next item on the exam-type list. If the Auto-Advance feature is off, the comment remains the same unless it is changed with the **Comment** rotary control.

Formatting a Disk

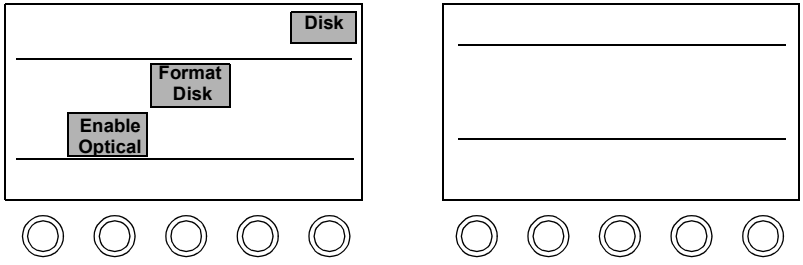
You must format an optical disk before using it for the first time, if the manufacturer did not preformat the disk. (The SONOS hard disk comes preformatted.) If you need to format an optical disk, you must power cycle the SONOS system (that is, turn the system off and then on again) after formatting has completed, to continue with digital storage and retrieval operations.

CAUTION Do **not** format or initialize the hard disk unless requested to by your Philips service representative. Formatting an optical disk or hard disk erases all information on the disk.

1. Touch **Disk**, and press Setup.

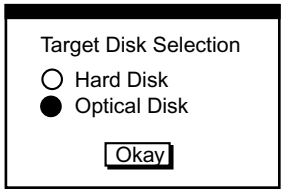


2. With the **Enable Optical** touch control on, touch **Format Disk**.



3. Select **Optical Disk**, highlight **Okay** with the trackball, and press Enter.

   Depending on disk capacity, formatting can take up to one hour. You can continue to image while the disk is being formatted. To format the other side of the disk, turn it over and touch **Format Disk** again.



NOTE

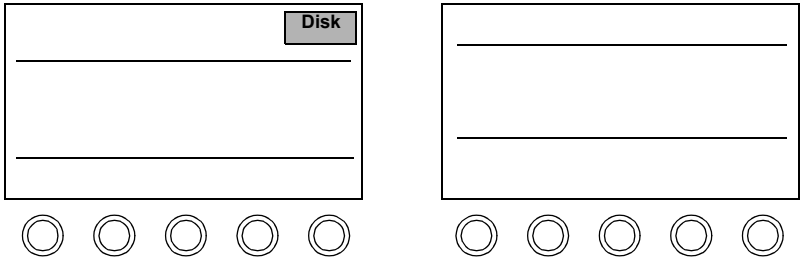
If your system has the Integrated Digital Interface option, you must power cycle the system after formatting a disk. See the *Using Integrated Digital Interface (IDI) User's Guide* for more information.

Initializing a Disk

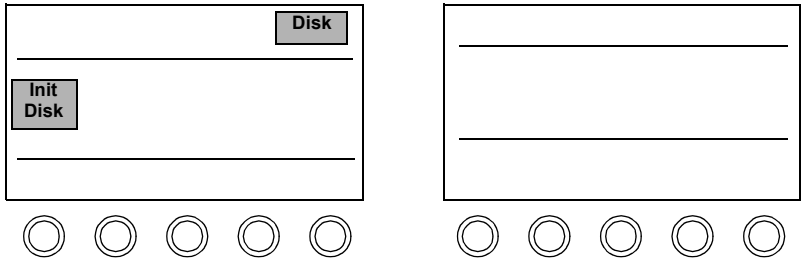
Initializing a disk prepares the preformatted disk for storage and retrieval and also erases all files on the disk. You can initialize both hard disks and optical disks. (The hard disk comes preinitialized.) The optical disk must be initialized before use. You must initialize each side of an optical disk before using it for the first time.

CAUTION Do **not** format or initialize the hard disk unless requested to by your Philips service representative. Initializing an optical disk or hard disk erases all information on the disk.

1. Touch **Disk**.



2. Touch **Init Disk**. It takes about 10 seconds per side to initialize a disk, depending on disk capacity.



Configuring Disk Storage

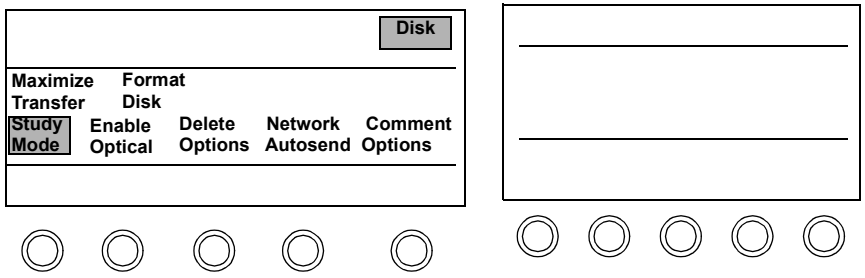
Tip: Many **Disk** and **Loop** settings can be preset. You can choose many combinations to best meet your needs and store them to your own preset.

Use the following controls to set up the disk options:

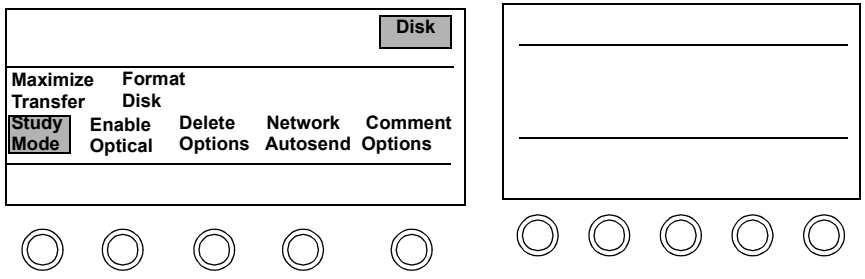
- Study Mode
- Enable Optical
- Delete Options
- Network Autosend
- Comment Options
- Maximize Transfer/Frames

Tip: For complete details on these controls, and the options that are available for setting up a disk for studies and transfer of patient information, please see the *Using Integrated Digital Interface (IDI) User's Guide*

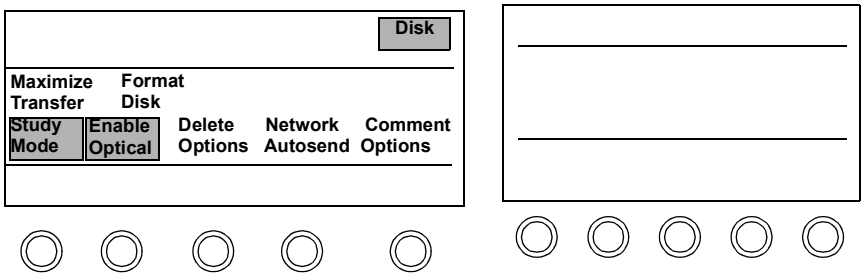
1. With a formatted disk in the optical disk drive, press **Setup**, and touch **Disk**.



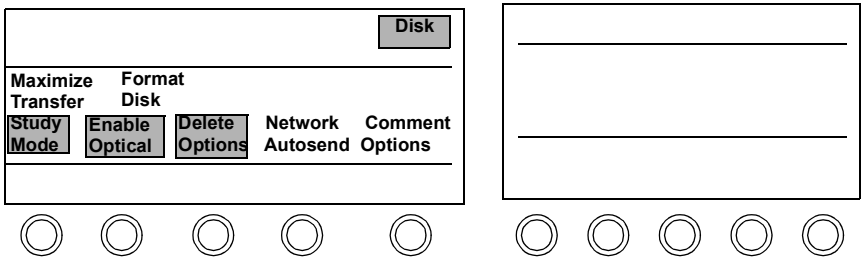
2. **Study Mode** is on by default. Storing and retrieving files with **Study Mode** on facilitates file management.



3. Touch **Enable Optical** if you want to store data on an optical disk. **Enable Optical** is off by default.



4. Touch **Delete Options** to choose the autodelete settings.

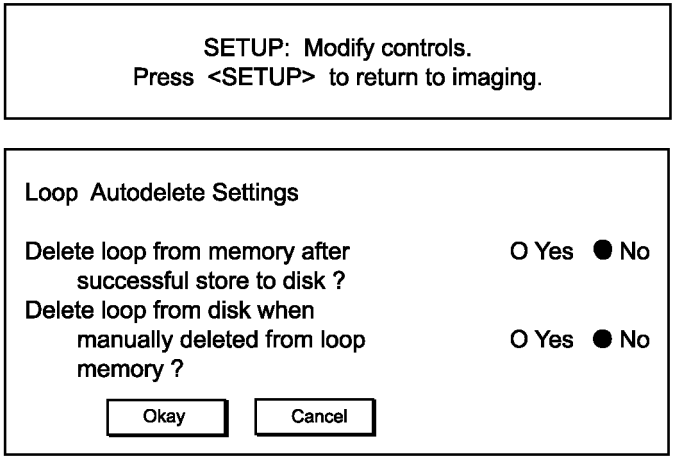


5. Use the trackball to select the autodelete options and press Enter . The system defaults to **No** for both options, including **Delete loop from memory after successful store to disk?** This means that loops that have been stored on the disk are not deleted from loop (CLR) memory. You may review and edit your studies on the ultrasound system. When you choose **Delete loop from disk when manually deleted from loop memory?**, the manually selected image is deleted from loop memory and the optical or hard disk simultaneously. (Touching **End Study** clears all loops from loop memory.)

   Note: Delete options can be preconfigured depending on the selected preset. Always check setup to be sure that the delete options are adjusted appropriately before you begin loop acquisition.

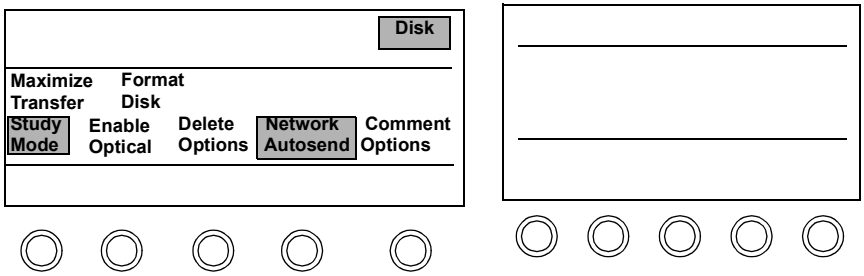
Note: If you select **Yes** for **Delete loop from disk when manually deleted from loop memory?**

and then touch **Delete all pages**, the system deletes *only* from loop memory.

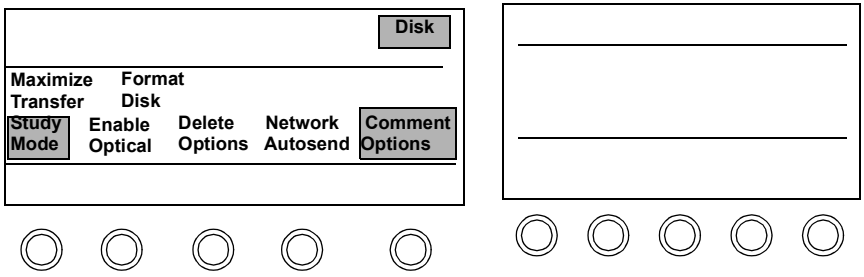

SETUP: Modify controls.
Press <SETUP> to return to imaging.
Loop Autodelete Settings
Delete loop from memory after successful store to disk ?
O Yes ● No
Delete loop from disk when manually deleted from loop memory ?
O Yes ● No
Okay
Cancel

6. Touch **Network Autosend** when you want to send images to the network server while the session is in progress. This command is available under the **Disk** touch controls when you press Setup.

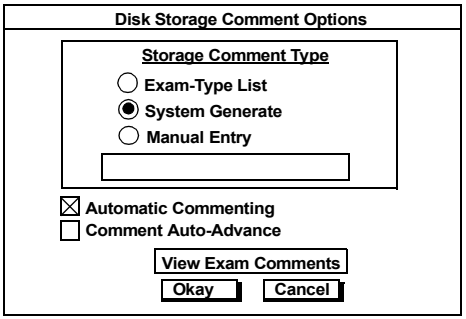
   Sending a complete study to a network can take some time. When you enable **Network Autosend**, as soon as an image is stored to the local disk, IDI begins sending the image to the network server. When **Network Autosend** is not enabled, the IDI system does not start sending the study to the network server until you touch **End Study**.



7. Touch **Comment Options**.

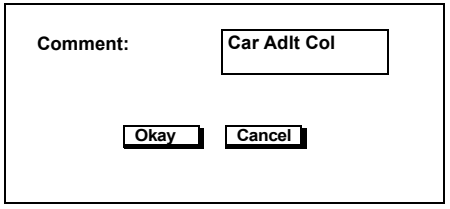


8. Use the trackball to select the comment options, select **Okay**, and press **Enter** .



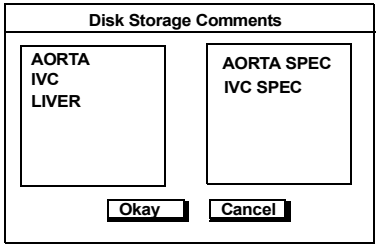
When you store a loop:

- If **System Generate** is on and **Automatic Commenting** is on, the image is automatically stored to disk with the system-generated comment. No DSR comment box appears and you cannot edit the comment.
- If **System Generate** is on and **Automatic Commenting** is off, the DSR comment box appears containing the system generated comment (in the screen's lower left corner). You can accept the comment by using the trackball to choose **Okay**, or you can press **Erase** and type in your own comment.



- If **Manual Entry** is on and **Automatic Commenting** is off, the DSR comment box is blank. Type in the comment or use the **Manual Entry** control on the left touch panel to select a comment, use the trackball to select **Okay**, and press Enter.

9. Select **View Exam Comments** to display the exam-type comments.

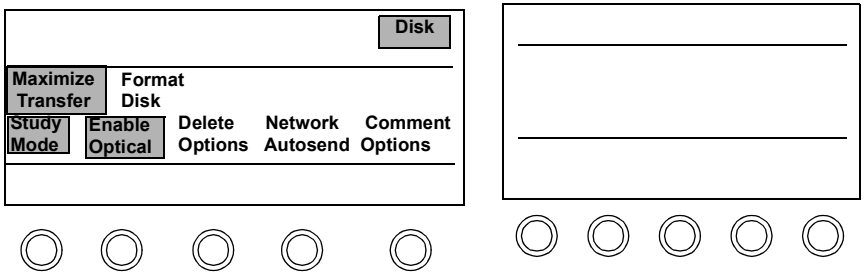


Tip: If you want to keep these changes, save them to a preset.

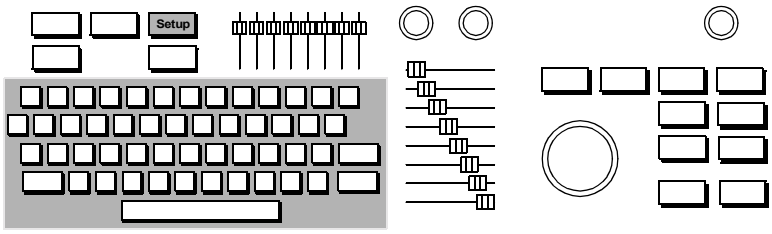
10. To edit a comment, select it with the arrow and press Enter. Type in the desired comment, highlight **Okay** and press Enter to accept the new comment list. Press ↵ on the keyboard to move to the next comment.

11. (Optional) To clear all of the comments, highlight the entire box and press Erase.

12. Touch **Maximize Transfer**. The control changes to **Maximize Frames**. Touching the control switches between the two options. **Maximize Transfer** sets the maximum frame rate to 120 Hz. **Maximize Frames** sets the maximum frame rate to 300 Hz.



13. Press **Setup** to leave Setup mode.



Storing Images to Disk

You can store images to disk by touching one of the following controls:

- **Disk Autostore**—Available under the **Loop** control. Automatically stores a loop or frame after you acquire and accept it. Images are stored under the current patient **ID.** Disk Autostore allows both automatic and manual displays.
- **Disk Store**—Available under the **Loop** control. Stores the currently selected loop, frame, or analysis report to disk. Images are stored under the current patient ID.
- **Store All Loops**—Available under the **Disk** control. Displays the **Store All Loops** window, which gives you the option of storing all unstored loops to the current study, storing all loops to a new study, or storing all bookmarked loops to a new study.

NOTE

If **Store All Loops** or **Bookmarked Loops** is selected, the patient ID information is cleared after being stored with the current patient information. If **Unstored Loops** is selected, the patient ID information remains.

Using these storage controls in conjunction with **Auto Display** on or **Auto Display** off provides you with a variety of acquisition and storage options. The following pages give you some examples of the most common scenarios. You can choose the options that best fit the needs of your environment.

NOTE

Always use **End Study** to close the current study and store all loops, frames, and analysis reports to disk. **End Study** also clears memory and patient ID and analysis information, so you are ready to start your next study.

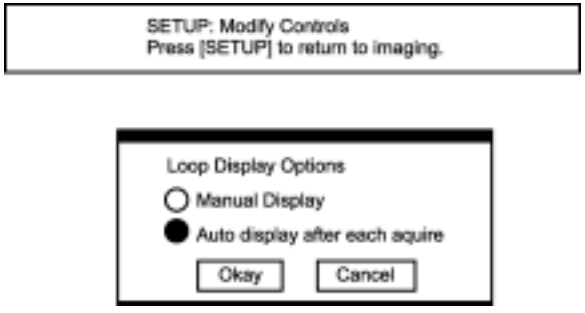
Using Disk Autostore with Auto Display

Use **Disk Autostore** in conjunction with **Auto Display** to acquire a loop, review it, and decide whether or not you want to store it to disk. This configuration provides you with a quality check on the loops stored to disk because you can review the loops during the exam and easily reacquire them, if necessary. Then, if the loops are acceptable, you can accept them, and they are automatically stored to disk.

NOTE

Disk Autostore on and **Auto Display** on are the suggested settings for cardiac presets.

1. Touch **Loop**.
2. To automatically display each loop after you acquire it:
   a. Press **Setup**.
   b. Touch **Display Options.**
   c. Select **Auto Display after each acquire**.



   d. With the trackball highlight **Okay** and press **Enter**.
   e. Press **Setup**.

NOTE

When **Network Autosend** is enabled, **Disk Autostore** is forced on. The **Disk Autostore** control is not available.

3. Touch **Disk Autostore** to enable it.

4. Press Patient ID and enter the patient information. (See "Setting up the Exam" on page 6-2 for more information.)

5. Acquire the desired loops, frames, or report pages.

   Each image is acquired to a page in loop memory, and the system automatically displays the image.

6. If the image is acceptable, press Enter.

   As the image is being stored to disk, a disk icon appears in the screen's upper right corner. The system returns to live imaging, and you can continue acquiring images during the disk storage process. However, you cannot perform any disk utility or retrieval operation until the storage process is complete.

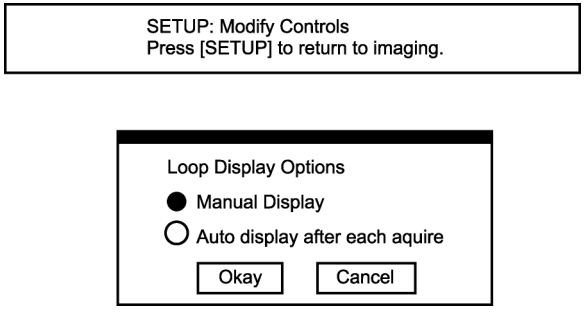
7. If the image is unacceptable, press Acquire or touch **Delete Page**.

   The image is deleted from loop memory and is not stored to disk. The system returns to live imaging.

Using Disk Autostore with Manual Display

Use **Disk Autostore** in conjunction with **Manual Display** to automatically store acquired loops without stopping to review them. Everything you acquire is automatically stored to disk and you can continue acquiring while the images are being stored. This configuration can be helpful if you want to review your studies off-line or at a later time.

1. Touch **Loop**.
2. To store the loops directly to disk without reviewing them:
   a. Press **Setup**.
   b. Touch **Display Options.**
   c. Select **Manual Display**.



   d. With the trackball highlight **Okay** and press **Enter**.
   e. Press **Setup**.
3. Touch **Disk Autostore** to enable it.
4. Press **Patient ID** and enter the patient information. (See "Setting up the Exam" on page 6-2 for more information.)

5. Acquire the desired loops, frames, or report pages.

   Each image is acquired to a page in loop memory and is automatically stored to disk. During acquisition, the white box in the screen's lower right corner disappears, indicating that acquisition is in progress. A disk icon appears in the screen's upper right portion while the image is being stored. The system returns to live imaging, and you can continue acquiring images during the disk storage process. But you cannot perform any disk utility or retrieval operation until the storage process is complete.

6. When you are done imaging, you can touch **Display** to see the images you have acquired and stored.

   All of the images have the disk icon in the screen's lower left corner indicating that they have been successfully stored to disk.

Using Disk Store with Auto Display

Use **Disk Store** in conjunction with **Auto Display** to acquire a loop, to review it, and to decide whether you want to store it to disk or reacquire it. This configuration provides you with a quality check and can be helpful if you want to review the images during the exam so you can easily reacquire them, if necessary.

1. Touch **Loop**.
2. To automatically display each loop after you acquire it:
   a. Press **Setup**.
   b. Touch **Display Options.**
   c. Select **Auto Display after each acquire**.
   d. With the trackball highlight **Okay** and press **Enter**.
   e. Press **Setup**.
3. Press **Patient ID** and enter the patient information. (See "Setting up the Exam" on page 6-2 for more information.)
4. Acquire the desired loops, frames, or report pages.

   Each image is acquired to a page in loop memory and the system automatically displays the image.
5. If the image is acceptable, touch **Disk Store.**

   The image is stored to disk, and a disk icon appears in the screen's upper right portion while the image is being stored. The system returns to live imaging, and you can continue acquiring images during the disk storage process. But cannot perform any disk storage or retrieval operations until the storage process is complete.
6. If the image is unacceptable, press **Acquire** or touch **Delete Page**.

   The image is deleted from loop memory and is not stored to disk. The system returns to live imaging.

Using Store All Loops

Use **Store All Loops** to

- Store all of the unstored loops to the current study. For example, you can enable **Manual Display**, continually acquire loops without stopping to review them, and then store them all to disk at the end of the study. The patient ID is retained.
- Store all loops to a new study with current patient data. You can choose this option to make a copy of your study. The patient ID is cleared after storage.
- Store all bookmarked loops to a new study with current patient data. You can create a subset of your study by bookmarking specific loops and storing only those bookmarked loops to a new study. (This is described in Chapter 11 .) The patient ID is cleared after storage.

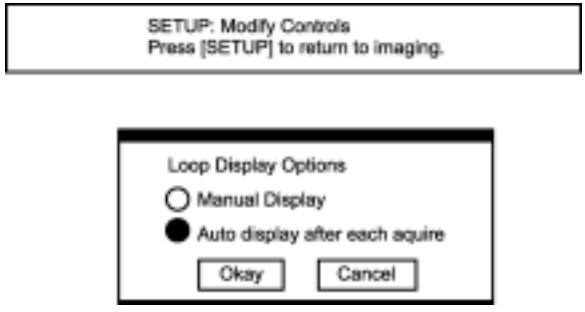
1. Touch **Loop** on the left touch panel.

2. If you do not want to review the loops, set the loop display options to **Manual**. If you want to display each loop after acquiring it, set the loop display options to Auto after each acquire.

a. Press **Setup**.

b. Touch **Display Options.**

c. Select **Auto Display after each acquire** or **Manual Display**.



d. With the trackball, highlight **Okay** and press **Enter**.

e. Press **Setup**.

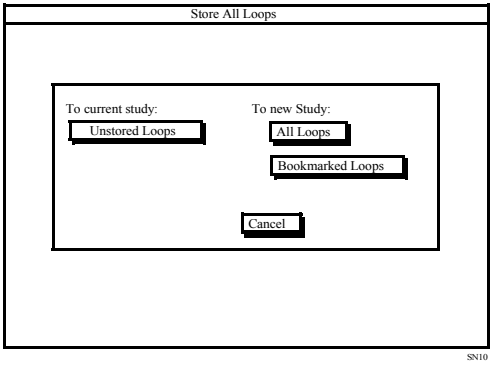
3. Press **Patient ID** and enter the patient information. (See "Setting up the Exam" on page 6-2 for more information.)

4. Acquire the desired loops, frames, or report pages.

5. Bookmark specific loops, if desired. (See Chapter 11 for details on bookmarking.)

6. Touch **Disk**.

7. Touch **Store All Loops.** The following window appears.

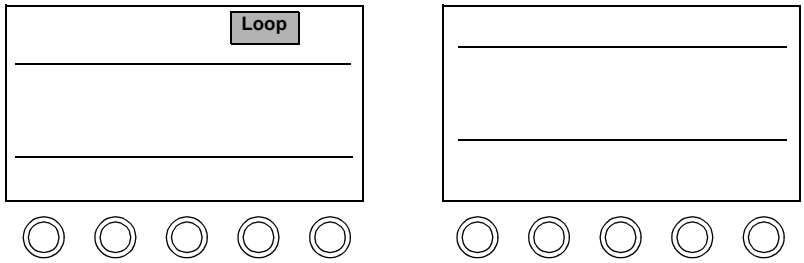


8. Choose one of the following options:

   - **Unstored loops**—Stores all of the loops to the current study. A disk icon appears in the screen's upper right corner while the image is being stored. Patient ID is retained.
   - **All Loops—**Stores all of the loops to a new study with current patient data. The message "Creating Study for" and a disk icon appear in the screen's upper right corner while the image is being stored. Patient ID is cleared after storage.
   - **Bookmarked Loops**—Stores all of the bookmarked loops to a new study with current patient data. The message "Creating Study for" and a disk icon appear in the screen's upper right corner while the image is being stored. Patient ID is cleared after storage.

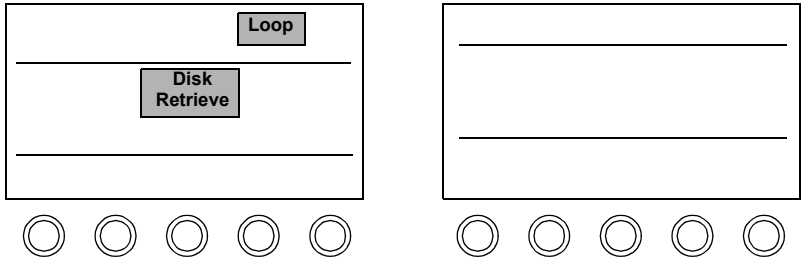
Retrieving Loops from Disk

1. Touch **Loop**.

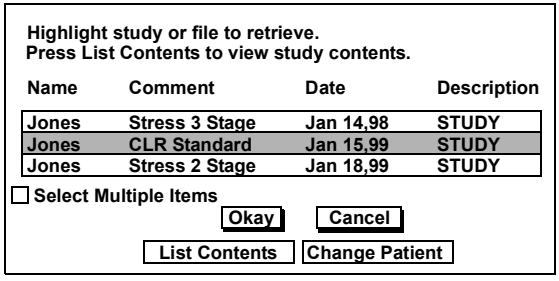


2. Touch **Disk Retrieve** to see studies matching the current patient ID.

The system displays a list of studies that match the current patient ID information. If there is no match, a message appears telling you that the patient ID does not exist.



3. To see a list of just the patient IDs on the current side of the disk, select **Change Patient**. To see a list of all of the patient IDs and associated studies on current side of the disk, select **Display All** from the Change Patient window.

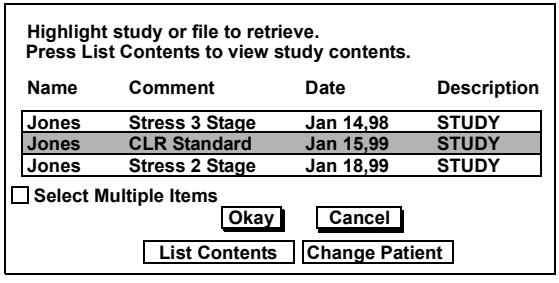


4. Use the trackball to position the arrow over the study you want to retrieve and press Enter.

   With the trackball highlight **Okay** and press Enter. You can also choose the study to retrieve by pressing Enter twice. To select multiple items from the list, check **Select Multiple Items**.

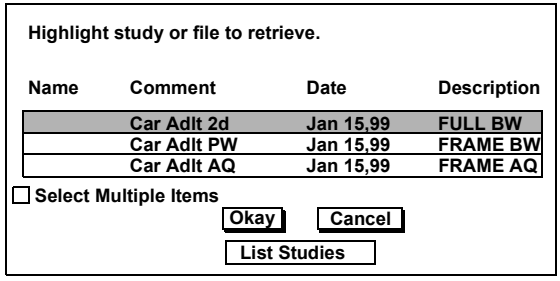
   You can select multiple items in the List Contents window only.

   All of the images in the selected study are loaded into loop memory for review. You can start reviewing the images using the **Page** rotary control before all of the images have been loaded into loop memory.

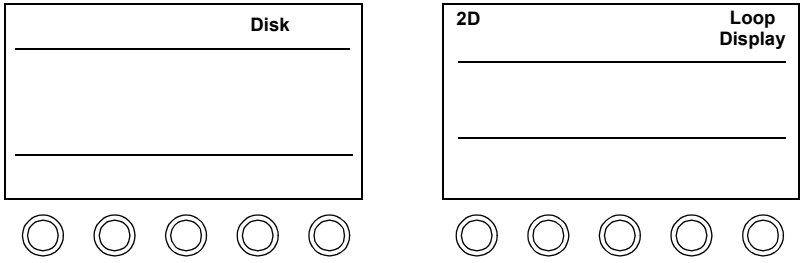


Tip: If you select a stress study, the system automatically activates the **Stress** option, and the **Stress** control replaces the **Loop** control.

5. To see a list of all of the files in the study, highlight **List Contents** and press Enter.



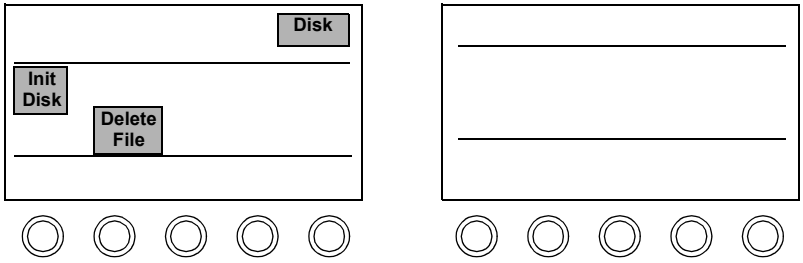
6. To return to live imaging, touch **Loop Display** or **2D** on the right touch panel.



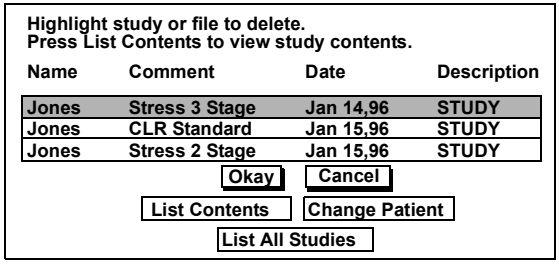
Deleting Files from Disk

Tip: To quickly delete all files on the hard disk or one side of an optical disk, touch **Init Disk**.

1. Touch **Disk** and then touch **Delete File**.

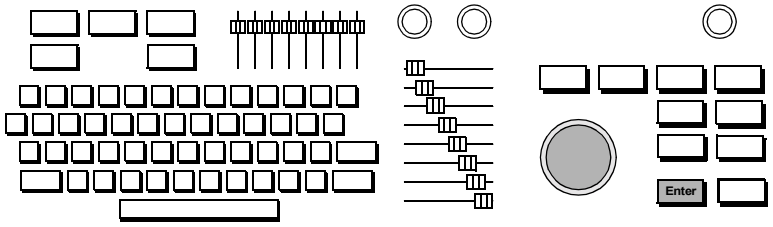


2. Using the trackball, move the arrow to the study you want to delete. Press Enter to highlight each selection. If you want to delete files from within a study, highlight the study and select **List Contents**.


Highlight study or file to delete.
Press List Contents to view study contents.
Name Comment Date Description
Jones Stress 3 Stage Jan 14,96 STUDY
Jones CLR Standard Jan 15,96 STUDY
Jones Stress 2 Stage Jan 15,96 STUDY
Okay
Cancel
List Contents
Change Patient
List All Studies

3. With the trackball highlight **Okay** and press Enter. A window appears asking you to confirm the deletion.

4. Highlight **Okay** and press Enter to delete the file.



Optical Disk Troubleshooting

Symptoms	Suggestions
Cannot store files to the disk.	Make sure the image or loop you want to store is displayed. Make sure the optical disk is initialized. Make sure the optical disk is not write-protected. Make sure the optical disk media is compatible with the current SONOS revision. See the table on page 4-5 for more information.
Optical disk fills up prematurely and gives a “Disk Full” message, even when sufficient disk space is available.	Rebuild the Optical Disk Database weekly to update the database files, and to allow full capacity use of the optical disk. Do these steps: **1.** Touch **Disk**. **2.** Touch **Rebuild Database**. **3.** Touch **Rebuild**.

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